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electrical contracting

Maintenance Section

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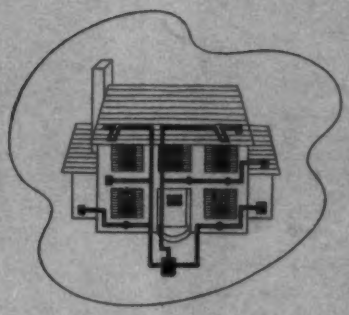

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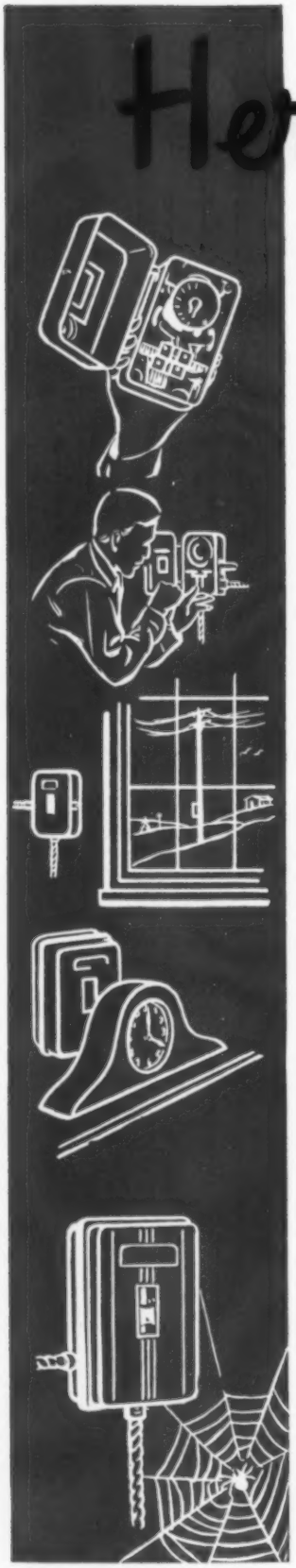

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This new G-E time switch is small and lightweight. It can be easily held in one hand—an important feature for quick, easy installation.

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GENERAL ELECTRIC

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Electrical Contracting, May 1940

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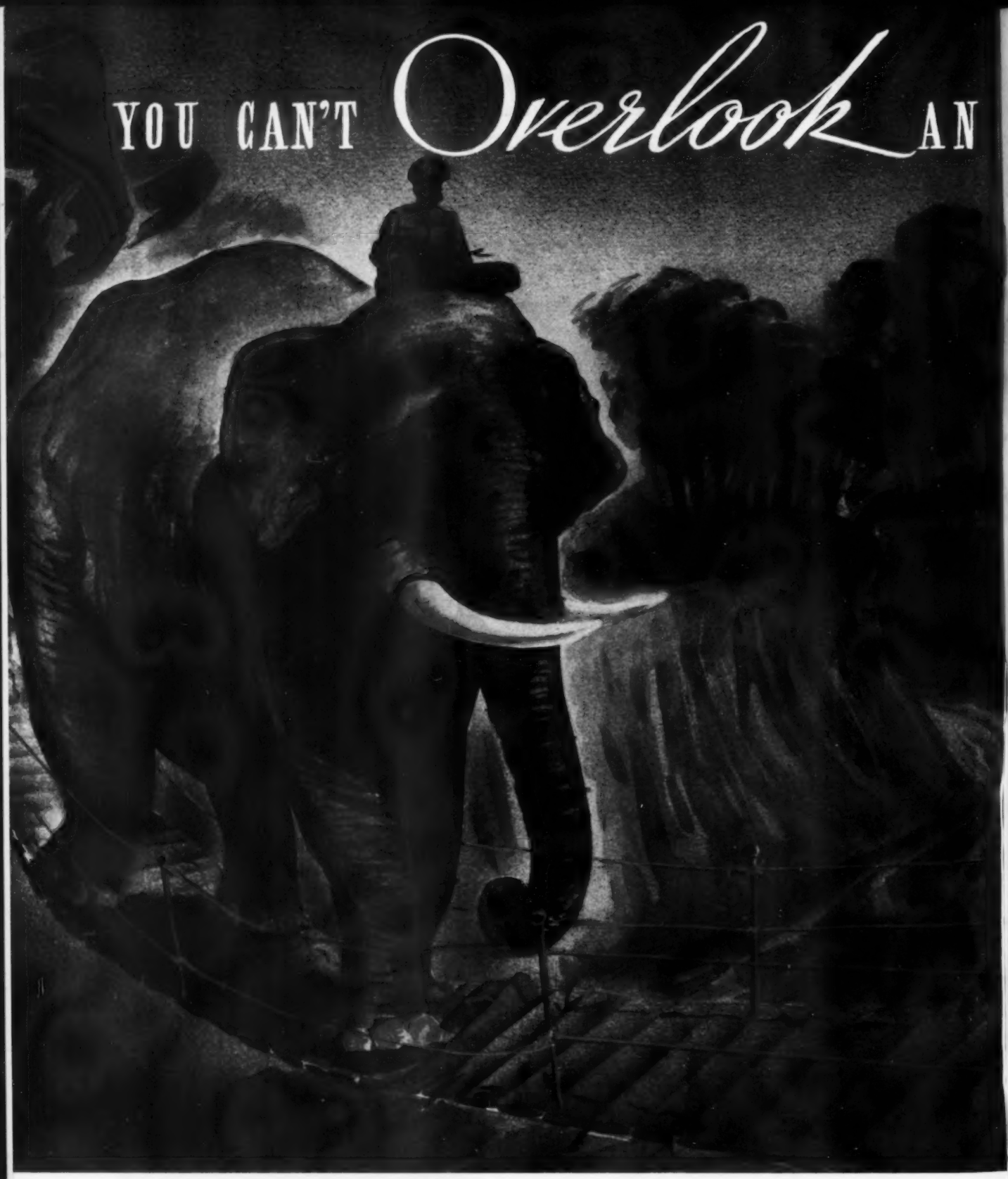

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In solving this pressing problem, let us remember that wire can be overloaded *mechanically* as well as electrically.

Fibrous covering is to wire insulation what steel is to concrete—a reinforcement, a permanent bond; it supplies the necessary degree of cohesion.

In the case of Dilec wire, with the new and novel fibrous covering, it has been made to do much more than just to reinforce.

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This complete coverage, combined with the flame-retarding, moisture-resisting qualities of the finish retards oxidation, hence prolongs life.

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ELECTRICAL CONDUCTORS

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This NEW Data Bulletin

BENJAMIN FLUORESCENT LIGHTING EQUIPMENT

TRADE MARK

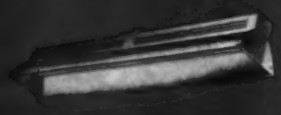
You will want to send for your copy of this latest Benjamin Bulletin because it not only gives you complete information on Benjamin's extensive line of Fluorescent Lighting Equipment but includes a wealth of statistical data which will answer many of your questions about the characteristics and application versatility of Fluorescent Lighting.

With this Bulletin on your desk, you have at your finger tips the concise information necessary to the specification of Fluorescent units engineered to provide highest levels of illumination and meet the best standards of modern lighting practice. Thus, it furnishes you with the information and data you need to provide the *exactly right* Benjamin Fluorescent unit for general or localized lighting of offices or factory, drafting rooms, production operations, benches, machines, color matching work or any one of dozens of other applications.

You can get your free copy of this New Bulletin at once by simply clipping and filling in the coupon below and mailing to Benjamin Electric Mfg. Co., Des Plaines, Illinois. No obligation, of course.

You'll find Complete Information on all these Benjamin Fluorescent Lighting Units in the New Bulletin

NEW BENJAMIN FLUR-O-LINE



A simple, heavy, sectional type unit for 18" and 36" Fluorescent Lamps. Effective and efficient Illumination of the working plane in either a continuous line or a wide area of light can be obtained by adding units either end-to-end or side-by-side. Asymmetric, concealed Alzak aluminum reflecting surfaces properly direct and control light. Auxiliaries and capacitors correct power factor and flicker. Furnished complete with wiring channel and necessary accessories.

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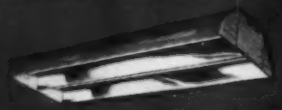

For both general and localized lighting. Provides 15 to 150 footcandles of softly diffused COLD light of either White or Daylight quality when mounted locally over production lines, inspection tables, work benches, etc. Uses two 48" Fluorescent Lamps mounted in individual Alzak aluminum reflectors housed in a slight steel hood. Has new type auxiliary and starting switch corrected for power factor and flicker.

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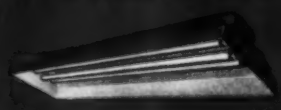
NEW BENJAMIN 3-LAMP STREAM-LITER



This three-lamp unit is specifically designed for general Fluorescent lighting of locations where it is desirable to provide from 25 to 80 footcandles of daylight illumination. It combines the low brightness quality of Fluorescent Lamps with the unexcelled diffusion quality of porcelain enamel. The lamps in this unit have a total light output efficiency of 75%. The light provided is free from glare and has softly luminous shadows. Power factor and flicker corrected by new type auxiliary. Has removable starter switch.

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electrical contracting

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction — industrial, commercial, and residential.

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TAKE A LOOK. These books, the Anaconda Wiring Survey and Guide, get the credit. I got them from my Anaconda distributor, the same fellow I buy Duracode from. All I did was ask the plant engineer if I could make a wiring survey of his plant at no cost. 'Course he said go ahead and when I showed him that the survey revealed how he could save a hundred bucks a month in power costs—well, he naturally gave me the job.

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Without obligation send me a copy of Anaconda's new Wiring Survey.

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electrical contracting

MAY, 1940

Bare Handed

WHEN I WAS A LAD, my father kept four driving horses. If Duke had the colic, we poured hot baking soda water down him from a beer bottle and kept him walking. If Daisy skinned her knees, we mixed up sulphur, gunpowder and lard and daubed it on. We knew what to do. We did it.

TODAY IF ANYBODY'S POODLE GETS A WARM NOSE, they rush him to the veterinary. We all drive motor cars, but we just know enough about them to get water when they boil, air when they bump, oil when they squeak, gas when they stop. For there's a service station on the corner.

WE ARE A PAMPERED LOT, particularly we electrical men. Life has been too sweet and easy for a long while in this fast growing industry of ours. Now times have changed. The honeymoon is over. We've got to go to work. We must start building our market, not just watch it grow.

TO MEET THIS SITUATION the electrical contractor will be obliged to do some reforming. For contractors don't like to sell. They like to be called in to do a job. They like to bid for work. They don't like visiting customers to create business. They don't like advertising and developing special services. And that's why their knees are skinned.

BUT WITH AMERICA FULL of underwired buildings—there is no reason why the electrical contracting business should have so many aches and pains. Competitive conditions, prices, bad policies of manufacturers, wholesalers and other contractors—all these colics can be doctored. It just needs sulphur, gunpowder and lard. It needs the old time spirit of independence.

MORE IMPORTANT THAN THAT IS THE FACT THAT management everywhere is eager to cut costs. And people everywhere want more comfort. And here we are! The trouble is that as an industry we have been stalling. We have been waiting for another friendly boom to carry us along. We have not been individually booming ourselves.

SHAKE IT DOWN AND YOU GET THIS—The contractor has neglected his selling too long. He is now suffering from it. But he *can* sell like any other business man—bare handed. Here then is his biggest management problem and responsibility. Here is his best immediate opportunity. We know what to do. Let's do it!

Paul Wheelock

GraybaR Specials!

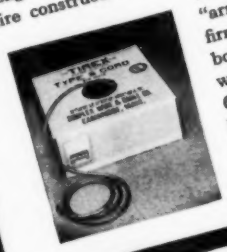
Ask for proof of "plus-value" on these items

Your GRAYBAR Man is anxious to help you get more profitable business from industrial and commercial establishments. He's ready to give you the facts and figures you need to furnish proof of "plus-value" on every bid you make.

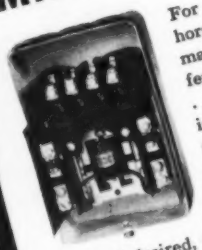
Remember, GRAYBAR has *all* the lines you need: (1) Quality lines and specialty items for customers who want assured performance and long-run satisfaction; (2) Competitively priced standard items for those to whom low first-cost is most important. Whatever the job you're after, you'll find the GRAYBAR Man ready to back you up with competent buying assistance on everything electrical.

CORDS-CABLE for portable equipment

Here's the *quality* line of cord and cable you need to make sales and make friends among industrial users of portable electric tools, welding equipment . . . everywhere tough, long-lasting leads or flexible cable connections are required. Many commercial uses, too, for photographer's lamps, business machines, and the like. Though high in first cost, it proves a real economy on a service-life basis wherever hard usage is encountered. » » » TIREX cords and cable are made on tire construction principles to provide extra resistance to crushing, abrasion or tearing. An "armor" of tough selenium rubber is firmly bound to the twine-reinforced body of the cable. Available in a wide range of sizes from popular 600-volt cords up to huge cables for heavy service. Ask your GRAYBAR Man for details, or write direct for literature and samples showing armored, long-life construction.



New GENERAL ELECTRIC MAGNETIC STARTER



For AC motors rated up to 2 horsepower, this new G. E. magnetic starter (Size 0) offers unexcelled compactness . . . convenience. Actually, it is little larger than a manual starter, yet it provides the advantages of push-button operation, isothermal overload protection and undervoltage protection — just as do starters three times its size. If desired, push-button or selector switch can be obtained in the cover of the new starter, making it a complete, self-contained control. Ask your GRAYBAR Man for details on CR-7006-050. » » » Remember, GRAYBAR offers the complete line of General Electric motors and controllers — every type your customers need for normal or special requirements, along with wiring supplies and accessories for convenient installation and unfailing performance. Write for literature helpful to more profitable sales of motors and control.

"When once I've installed products from GRAYBAR, I don't have to worry about losing all the profit on subsequent service and replacement calls."

— said Contractor G._____ I._____

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More WATTS through OLD PIPES

By W. T. Stuart

The Evans Electrical Construction Company of Kansas City, Missouri, is modernizing the electrical facilities of office buildings with small diameter wire. They have found building management receptive, even enthusiastic, to the prospect of getting more light and power through present conduits. They had cooperation of the utility and chief electrical inspector.

TYPICAL of the opportunities created by small diameter building wire for the electrical contractor is the Davidson Building located at 17th and Main Sts., Kansas City, Missouri. It is a 12-story building of concrete construction. The original feeder layouts was exceptional in that it provided ample additional capacity for future load.

The building is supplied from a 600 ampere single phase 60 cycle alternating current service for lighting with four lighting feeders, each of three 3/0 wires in 2-in. conduits, each feeder supplying three metering panels, one on each floor.

From the distribution panels three runs of ¾-in. conduit and one run of ½-in. conduit run to ceiling outlets in four bays, and ½-in. conduit extended to two additional bays. The branch circuits on each floor had capacity available for 11 circuits of number 14 type R wire.

Under the plan requested by the prospective tenants the new branch circuit layout, to serve 28 ceiling and 24 convenience outlets, required 22 circuits with 1000 watt initial load per circuit for each floor. This was more than double the load that could be served from the conduits installed. The contractor reports that a preliminary estimate on the cost of running new branch circuits and installing new fixtures to meet the requirements was $7,900. The building was leased by the government on a competitive basis and the owner did not feel that it was possible to spend that sum. Harry Evans, the contractor, says, "It looked like both the tenants for the building and a job for us were lost."

He then tackled a layout employing small diameter type RU Laytex wire. His calculation showed that he could pull in seven number 10 wires in a ¾-in. conduit and still have more free area than the National Electrical Code required. This provided 6000 watts for each ¾-in. conduit and 4000 watts for ½-in. conduit which proved to be the amount needed.

From the original outlets short surface extensions were run in Wiremold and approximately 20,000 ft. of number 10 type RU Laytex wire was pulled in to replace the old number 14 wire.

From the accompanying typical floor plan it will be noted that number 10 wire branch circuits were employed with a number 10 neutral common to 6 circuits. The branch circuit breakers are rated at 15 amperes and the extra wire size is used to reduce voltage loss. The design load is 1000 watts per circuit. Under these conditions, the maximum unbalance that could occur, an open circuit in one leg of the feeder, would cause a maximum of 25 amperes in the neutral from three circuits, a safe load for number 10 wire. Under normal use, the circuits are so balanced

ELECTRICAL INSPECTOR

Leo J. McCormick said—"This job is a splendid example of the kind of work the code makers foresaw in granting approval for the use of small diameter conductors in existing conduits. It is business for our industry that we are concerned with and not creating a wrecking job in channeling, and patching."

that there is little or no current flowing in the neutral.

It is well to note, however, that this method of calculating neutral size is not universally applicable and used here only under special permission. Where design loads are likely to be exceeded it is customary to install neutral conductors with capacity equal to the maximum possible unbalanced current, based upon the capacity of the associated protective devices. However, assuming some diversity for the neutral conductor in rewiring work where space in old conduits is limited, is not an uncommon practice.

New indirect fixtures were installed, the old metering panels removed and replaced by new load centers in the existing cabinet and reconnected to the existing feeders. The whole job was completed at a cost of $4,800.

When the power company connected to the service switch, a serious condition of heating in the sub-feeder fuses was discovered. This, however, was found to be due to bad maintenance rather than to overload. After testing each circuit with a tong-type ammeter under full load, the current was found to be well within the capacity of the feeder and the fuse. Contacts were given a thorough cleaning and short copper bars were soldered across the knife switch blade hinges and the adjoining fuse clip. It was found that continued heating had melted away a quantity of compound around the bolts holding the clips to the slate. The bolts had loosened, consequently loosening the contact in the switch and fuse clips. Fuse clip clamps were then applied to all fuses. Heating, previously serious at only half the load, was completely eliminated.

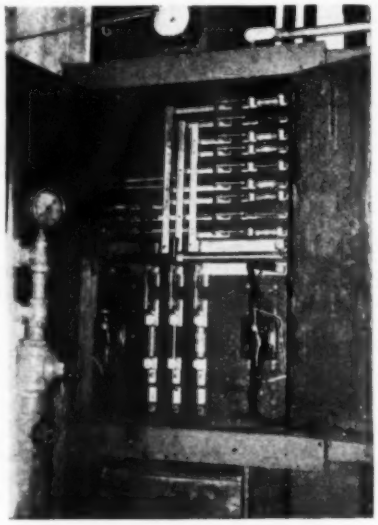
The final test showed 30 to 50 foot candles with all lamps burning.

That is the contractor's side of the story. Pulling in more watts in old pipes made a job that would not have been carried out at all if it had been necessary to employ conventional wiring methods.

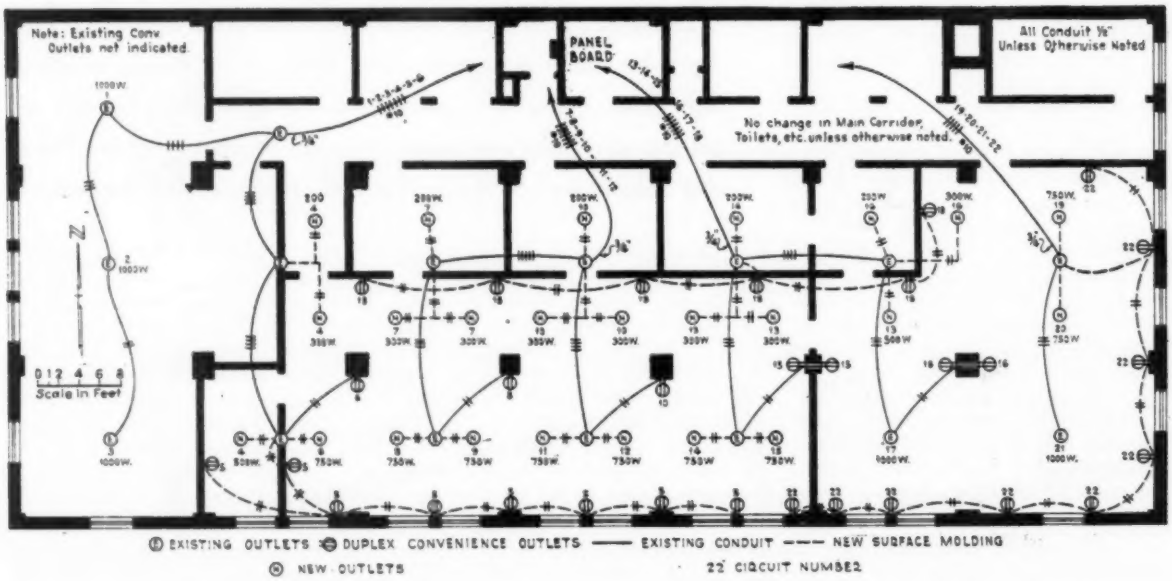
There was another party to the contract, however, who was just as much concerned as contractor Evans. Harvey J. Schmelzer of the Guignon Real Estate Company handles the Davidson Building property. He also had a word to say.

"We had the opportunity to lease several floors to a federal department. Specifications of the lease required more lighting than the existing wiring system could serve.

"Replacing the existing branch circuit conduits would have run up the cost to a point where we would probably have lost the customer. The contractor, Harry Evans, proposed the use of small diameter wire in the existing conduits and short surface extensions to accommodate the additional fixtures.



TYPICAL FLOOR *plan showing the new circuits drawn into existing conduits and surface extensions to new fixtures and plug receptacles.*



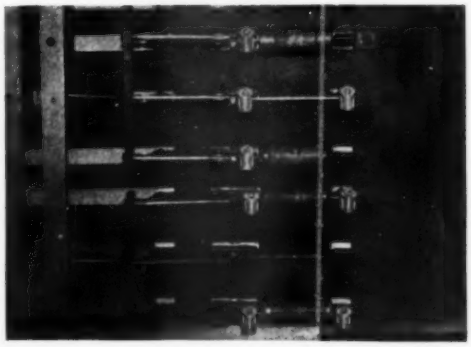
"The Davidson Building rewiring job proved so satisfactory that we are now applying similar treatment to four other properties. We hope that the present inconvenience of requesting special approval in detail for each job can soon be eliminated, however, we have had fine cooperation from the contractor, inspector and utility in expediting this work."

From the Kansas City Electrical Inspection Bureau, Chief Inspector Leo J. McCormick expresses the reaction of his department. "The Davidson building job is a splendid example of the kind of work that the code makers foresaw in granting approval for the use of small diameter conductors in existing conduits for rewiring old buildings. We are pleased to say that it was largely through the initiative and urging of this department, cooperating with labor, contractors and jobbers that the use of small diameter wire was advanced in Kansas City. This department continues to cooperate with electrical contractors in granting special permission for such installations in advance of formal approval by the National Electrical Code.

"A few words of explanation as to how these installations are handled may be interesting. First, the contractor must submit a proposed wiring plan to this department for approval. After approval he may secure the allotted number of feet of wire to do that particular job. Then follows the inspection of the completed job and clearance.

"We might add that we have realized for some time that something must be done to create rewiring jobs and this material can do it. It is business for the electrician that we are primarily concerned with and not creating a wrecking job in channeling, patching and plastering.

"Inadequate wiring in commercial structures is not only a handicap to the owner in providing his tenants with adequate lighting but frequently develops into serious overloading and dangerous over-fusing. The new small diameter wires provide a means of correcting these conditions at a very reasonable cost."



CLOSE-UP *of main panel shows fuse clamps and new connecting bars between switch blade hinge and fuse clip. Heating had melted compound leaving the studs loose.* MAIN PANEL *was cleaned and renovated. Existing circuits proved ample in size. Heating traced by instruments to bad contacts on clips was eliminated by clamps (at left).*

LIGHTING WAS *upped six times by electrical modernization with small diameter wire in this building, results—new panels, wiring, wiring devices and fixtures.*

ELECTRICAL CONTRACTOR

Harry Evans said—"On this project small diameter wire saved us a job. For us, however, the actual work of installing the small diameter wire represented only a part of the job. Renovating the service entrance equipment, new branch circuit panels, surface extensions and new fixtures all figured in the job total."

Rules for the installation of small diameter wire have not been formally adopted by the city inspection department but, pending official Code tables of conduit fill, contractors in Kansas City are using 50 per cent of the conduit area as the maximum fill when there are four or more wires to be drawn in. At this percentage of fill, contractors report that the pull is not difficult, usually easier than pulling out the old conductors.

Under normal conditions the new conductors are pulled in as the old wires are removed. In tough pulls, where old insulation has deteriorated or jams in the conduit, iron fish wire is trailed in and the new conductors drawn in later.

The question often asked by contractors about all small diameter wires is—"Isn't the insulation subject to serious injury in handling and pulling due to the reduced thickness?" Manufacturers claim that the new insulations are of high quality, mechanically equal to or superior to Code type R insulation. Although no special care or precautions were observed by contractor Evans on the Davidson Building job, there was no apparent injury to the insulation in handling or pulling and the finished job tested satisfactorily for insulation resistance.

Another important feature that brought favorable comment from everyone concerned was the minimum of inconvenience caused the tenant. This made it possible for the contractor to operate the job during ordinary working hours and permitted continuous use of the premises by the tenant.

Figuring VOLTAGE DROP

Voltage loss is one of the most important engineering problems the contractor encounters. In figuring large-amperage circuits, the effect of reactance is very marked and must be taken into consideration. Mr. Smedley, an authority on this subject, vividly illustrates what can happen in heavy-duty circuits.

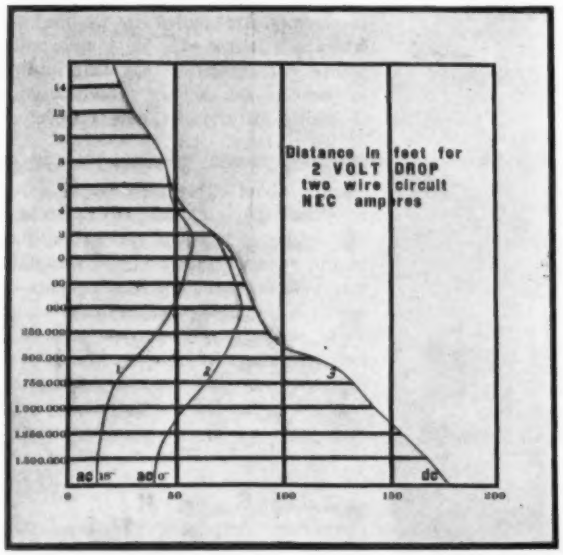
By A. B. Smedley
Anaconda Wire & Cable Co.

DOWN through the years we in the electrical industry have been piling up a mass of proof that adequate wiring pays—whether in home, store or factory. We have shown that line losses could be reduced, with definite savings to the user. We have talked about utilization losses in lights and apparatus—and shown that a 10 per cent line drop would cause a 30 per cent loss in light, for example. We have proved that the savings we can make will pay for the cost of rewiring jobs, sometimes in a period of a few months.

Gradually, we have learned to talk so that the layman, our customer, understands us. We have interpreted our electrical language into terms that can be understood. Better Light, Better Sight, Better Cooking, A Path of Light. But back of all these, we still have to reckon with the intricacies of electrical performance—or our customer will not get the benefits of a perfect electrical system.

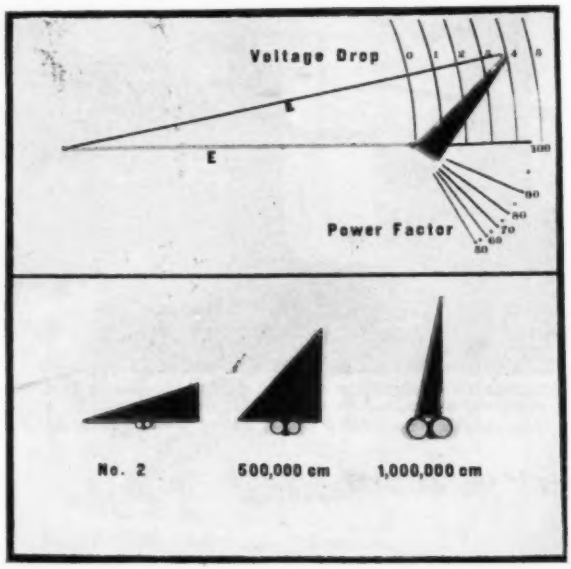
It is important to simplify things electrical, when and where we can. But some things can be simplified too much—and one place where this can happen is in the laying out of heavy duty circuits. Voltage drop can be a demon in disguise. So a brief glimpse at this problem is in order.

A resistance table helps you check line drop and adequacy for direct current, but only up to No. 2 Awg wire on alternating current. With the advent of networks in downtown areas, heavy commercial lighting and air conditioning loads, large circular mil wire sizes have become common. It is in these cables on alternating current that we have voltage drops greater than the resistance drops. Reactance also produces voltage drop and reduced adequacy in alternating current circuits and in cables beyond 500,000 CM it is



DANGER SIGNAL *for alternating currents is set at #4 Awg. for open wiring (curve #1) and at #0 Awg. for cables or wires in conduit with approximately zero spacing (curve #2). The circuit lengths for direct current are shown for comparison (curve #3). Values shown for alternating current (curves #1 & #2) are figured with the power factor which produces the maximum drop.*

POWER FACTOR *determines the shape of the triangle on the upper diagram. The resistance drop side is placed at various power factors, and thus determines the voltage differences between the horizontal voltage line E and the sloping black line E, which represent voltage at the end and beginning of the circuit, respectively.*
LOWER DIAGRAM *shows effect of resistance, reactance, impedance and power factor on voltage drop. The three triangles represent on a percentage basis the alternating current "nature" of wires for #2 Awg.,—500,000 CM and 1,000,000 CM. In each triangle the horizontal line is resistance drop, the vertical line is reactance drop and remaining side the impedance drop. Note that for #2 Awg. the resistance causes most of the drop, while in 1,000,000 CM the reactance causes nearly the entire impedance drop.*



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CIRCUIT LENGTH FOR ONE VOLT DROP

Three-Phase, 80% Lagging Power Factor

1-Conductor Cables in Close Proximity in Conduit in Air—60° C. Operating Temperature

Size Awg or Circular Mils	Resistance Max. A C at 60°C per 1000 Ft. Ohms	Reactance at 60 Cycles per 1000 Ft. Ohms	CURRENT IN AMPERES																	
			3	5	10	15	20	25	30	40	50	60	80	100	120	150	200	250	300	400	500
			Permissible Length of Circuit (One Way) Feet																	
Installation in Non-Metallic Conduit or Iron Conduit in Air																				
14	3.024	.05090	79	47	24	16	12	9												
12	1.901	.04742	125	75	37	25	19	15	12	9										
10	1.196	.04414	196	118	59	39	29	24	20	15										
8	.7451	.04704	309	186	93	62	46	37	31	23	19	15								
6	.4824	.04353	468	281	141	94	70	56	47	35	28	23	18							
4	.3034	.04080	722	433	217	144	108	87	72	54	43	36	27	22						
3	.2406	.03956	892	535	268	178	134	107	89	67	54	45	33	27	22					
2	.1908	.03837	1098	659	324	220	165	132	109	82	66	55	41	34	27	22				
1	.1513	.03738	1344	806	403	269	201	161	134	101	81	67	50	46	34	27				
Installation in Non-Metallic Conduit Only in Air																				
1/0	.1200	.03636	1577	946	473	315	237	189	158	118	95	79	59	47	39	32	24	These values calculated with the reactance component increased 20% based on experimental data.		
2/0	.09518	.03522	1899	1139	569	380	285	228	190	142	114	95	71	57	47	38	28			
3/0	.07546	.03434	2265	1359	679	453	340	272	226	170	136	113	85	68	57	45	34	27		
4/0	.05931	.03387	2682	1609	805	536	402	322	268	201	161	134	101	80	67	54	40	32	27	
350,000	.03651	.03249	3664	2198	1099	733	550	440	366	275	220	183	137	110	92	73	55	44	37	27
500,000	.02555	.03140	4479	2687	1343	896	672	537	448	336	269	224	168	134	112	90	67	54	45	34	27
600,000	.02164	.03125	4844	2906	1453	969	727	581	484	363	291	242	182	145	121	97	73	58	48	36	29
750,000	.01739	.03063	5364	2872	1609	1073	805	644	536	402	322	268	201	161	134	107	80	64	54	40	32
1,000,000	.01339	.02982	5998	3599	1799	1199	899	720	600	450	360	300	225	180	150	120	90	72	60	45	36
Installation in Iron Conduit Only in Air																				
1/0	.1200	.03636	1502	898	449	299	225	180	150	112	90	75	56	45	37	30	22	These values calculated with the reactance component increased 50% based on experimental data.		
2/0	.09518	.03522	1787	1072	536	357	268	214	179	134	107	89	67	54	45	36	27			
3/0	.07546	.03434	2111	1266	634	422	317	253	211	158	127	106	79	63	53	42	32	25		
4/0	.05931	.03387	2473	1484	742	495	371	297	247	185	148	124	93	75	62	49	37	30	25	
350,000	.03651	.03249	3298	1979	990	660	495	396	330	247	198	165	124	99	82	66	49	40	33	25
500,000	.02555	.03140	3961	2376	1188	792	594	475	396	297	238	198	148	119	99	79	59	48	40	30	24
600,000	.02164	.03125	4246	2547	1274	849	637	510	425	318	255	212	159	127	106	85	64	51	42	32	25
750,000	.01739	.03063	4654	2792	1396	931	698	558	465	349	279	233	175	140	116	93	70	56	47	35	28
1,000,000	.01339	.02982	5143	3086	1543	1029	772	617	514	386	309	257	193	154	129	103	77	62	51	39	31

1. For other voltage drops, multiply the lengths in the table by the desired drop in volts. For example: No. 4 wire will carry 15 amperes 144 feet for a drop of 1 volt. If a drop of 3 volts is permissible, the permissible length = 144 x 3 = 432 feet.
2. For other currents, multiply the lengths in the table by the ratio of the current in the table to the new current. For example: the table shows a permissible circuit length of 536 feet for a No. 4/0 cable in non-metallic conduit carrying 15 amperes at a drop of 1 volt. If it should be desired to carry 150 amperes at a drop of one volt, the permissible length = $536 \times \frac{15}{150} = 54$ feet.
3. In using these tables for amperes other than those listed, check against Table No. 34 to make sure the N.E. Code permissible current is not exceeded; or Table No. 36 for N.E.M.A. maximum permissible current.
4. A C/D-C Resistance ratio in accordance with Table II N.E.M.A. report of Determination of Maximum Permissible Current Carrying Capacity of Code Insulated Wires and Cables for Building Purposes, June 27, 1938.
5. Sizes No. 14 to 8 Awg are solid wires; No. 6 Awg and larger are stranded, Class B stranding in accordance with A.S.T.M. Designation B8-36.
6. Reactance computed for equivalent spacing equal to insulated cable overall diameter plus 10%.
7. For single phase reduce the above circuit lengths by 14%.

often more important than resistance drop. Power factor less than 100 per cent will greatly increase the drop due to reactance and in many cases it is quite impossible to reduce line drop by increasing the cable size.

In a recent power job the calculated resistance drop was five volts for a circuit of 1,500,000 CM cables supplying a load whose power factor was 55 per cent. The actual measured drop was sixty-seven volts, the machine would not operate and the circuit was worthless. If the cables, which were spaced nine inches apart, were doubled in size—that is, to 3,000,000 CM—the drop would still be more than sixty volts. However, if the original 1,500,000 CM cables were moved close together the drop would be reduced to 32 volts. If two 750,000 CM cables had been used per phase with each group of cables phased A, B and C installed in ducts with minimum spacing, or in three-conductor cables, the voltage drop would be reduced to about fifteen volts. Furthermore, if it were possible to correct the 55 per cent factor up to 90 per cent the voltage drop would begin to approach the original calculated resistance drop of five volts.

It is a good rule never to use cables larger than 500,000 CM on alternating current for service at 600 volts or less. Use as many smaller cables as necessary per phase to carry the load. It is good engineering to parallel cables rather than to use larger cables, because the circuit voltage will be better. It is good economy, too, because such cables are stocked by all large manufacturers. The extra footage often costs less money.

Some simple fundamentals will serve to remove the mystery from alternating current terms.

A. Resistance is familiar to all of us; it has to do with the size of the wire—doubling the circular mils halves the resistance. This ratio does hold true exactly in alternating currents for large CM cables, but the effect is generally not more than 10 per cent increased resistance.

B. Reactance depends on two things, the diameter of the copper conductor and the distance center to center between conductors—the less the spacing the less the reactance. Minimum reactance is obtained when the wires have zero spacing, but the reactance will not be zero. Reactance data can be obtained from published tables and graphs.

C. Impedance is the sum of resistance and reactance but not a simple sum in arithmetic. Laid out to scale with resistance at right angles to reactance, we complete a triangle and the third side is the impedance. An illustration of resistance drop, reactance drop and impedance drop is shown in the diagram. The horizontal sides represent resistance drop, the vertical sides are the reactance drop and of course the remaining side of each triangle represents the impedance drop. Note how the power factor which determines the position of the impedance triangle in the illustration will affect the voltage drop. Power factor is simply a ratio of $\frac{\text{real watts}}{\text{volts x amps.}}$ But its affect on adequacy is tremendous in heavy circuits.

These brief examples provide a guide to what you can expect in dealing with a.c. circuits, and indicate some of the danger points. On many jobs, your own past experience will be your assurance that the job is being done right. But when you face an unusual job, accurate computation is the only way to be sure of the ultimate result.

The computation will involve:

A thorough knowledge of distribution layout.

Choice of proper voltage for the system.

Demand factors.

Power rates.

Load factors.

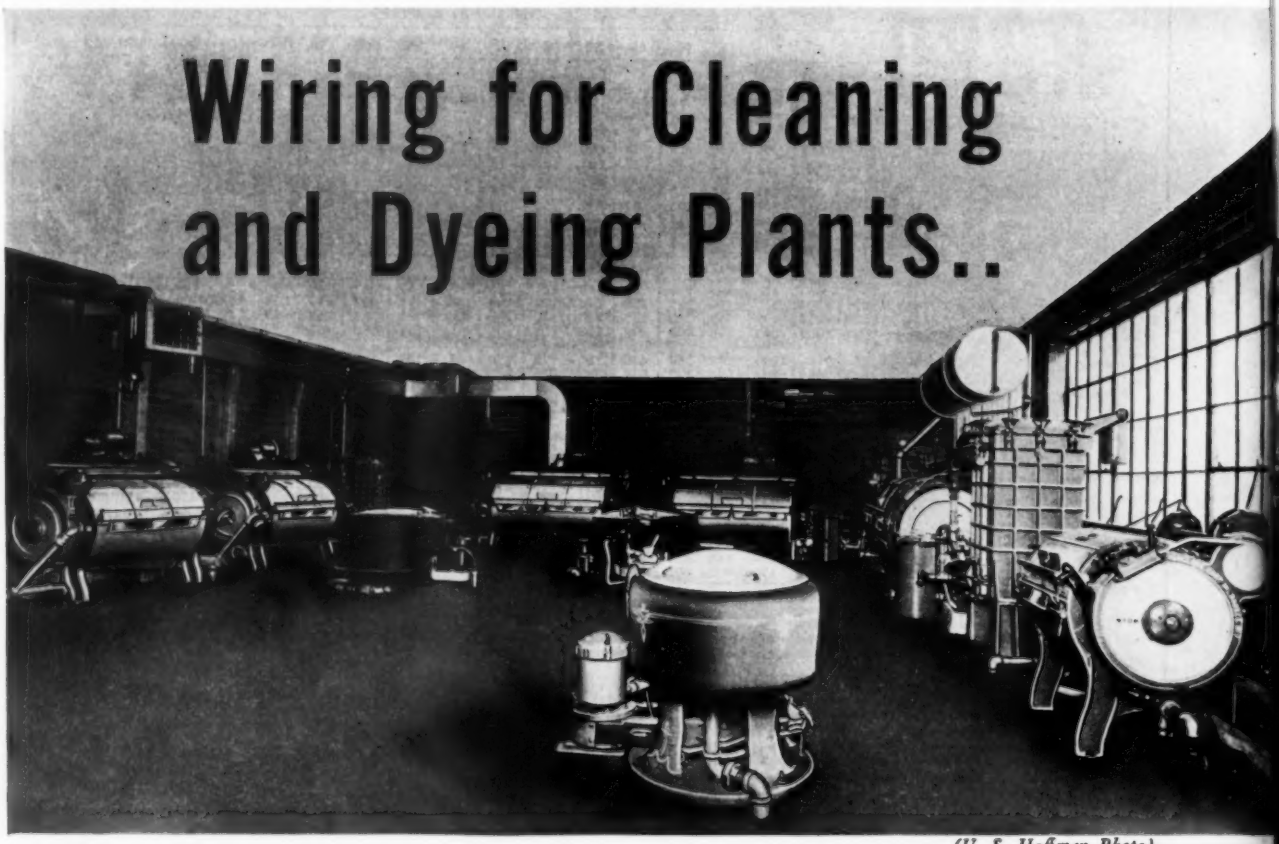
Power factor.

Cable impedance data.

Plus, of course, Code standards.

The correct use of these mathematical tools will give you and your customer the adequate wiring that is so badly needed.

Wiring for Cleaning and Dyeing Plants..



(U. S. Hoffman Photo)

A reminder list of items to check when planning the wiring.

Eleventh in a series covering specific industry requirements.

THE business of cleaning and dyeing covers a broad field, and one that is coming to the front as a steady paying enterprise in every community. So long as "clothes make the man", there is work to do in keeping garments cleaned, pressed and repaired. But this business extends also to rugs and draperies. More recently fur cleaning and storage have been added as departments of many progressive cleaners and dyers.

This industry receives about $600,000,000 per year for its services. There are about 12,500 reliable cleaners and dyers in this country. Their average investment in plant and delivery equipment is about $50,000. Perhaps 100,000 additional neighborhood shops could be accounted for who do some kind of cleaning work on a small scale.

The cleaner and dyer needs good light and electrical heat, also a varying amount of motor power. It is estimated that one motor is owned for every $3,000 in annual sales volume in this industry. The trend is definitely toward individually motored machines. Moreover the modernization and expansion of plants is bringing explosion proof motors, controls and lighting equipment into wide use.

Successful operators in this industry stress quality work at fair prices. And since so much of the production depends upon hand labor, good illumination ranks high on the list of aids. Every plant has critical seeing jobs for which modern illumination makes a distinct savings in reduction of damage to materials, and production cost.

So the wiring system for cleaning and dyeing plants involves more than the usual reasons for good planning. The arrangement of lighting outlets and circuits must suit specific needs at washing machines and extractors. The checking and sorting, inspection, spotting, pressing and repair areas all require well planned illumination. Then the office and customer space call for modern intensities.

In the cleaning areas the use of naphtha solvent requires explosion proof wiring and equipment that conforms with National Electrical Code requirements for Class I group D hazardous locations. This is another place where wiring must be planned carefully to assure proper safety.

The installation of motors and control in general requires special attention to safety of operators. For em-

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ployees in these plants are not mechanically minded as in larger industries. So distribution panels, control stations and all plug-in locations, as for heavy electric irons or rug scrubbing machines, should eliminate confusion and human hazard to the utmost.

Nearly every community has plants that were built years ago. These are ripe for improvement in lighting, modern motor and control applications and for relief from overloaded wiring systems. When changes are made to new types of machines, owners are more interested than before to provide good lighting. Other situations will also be disclosed that will improve working conditions—perhaps a ventilating fan to remove foul air, or heavy duty circuits to the ironing outlets.

Whether a plant is being modernized, expanded or moved to new quarters, the following items should be checked against the wiring layout.

GOOD SEEING *spells quality workmanship with less effort for many hand operations in the cleaners plant. (General Electric Co. Photo)*

Check List for Cleaning and Dyeing Plants

MOTOR DRIVEN EQUIPMENT

Air Compressor
Air Conditioning
Battery Charging Sets
Calender Drying
Calender Surfacing
Carpet Scrubbing Machine
Carpet Sweeper
Centrifugal Extractor
Clothes Tumbler
Colender
Drying Cabinets
Dust Collectors
Dust Exhausters
Dyeing Machines
Dyeing Tumbler Wheels
Elevators
Fans, Ventilating
Feather Cleaners
Flexible Shaft Scrubber
Fulling Mills
Indigo Grinders
Ironing Drums
Mangles
Ozonators
Pressing Machines
Pressure Filters
Pumps
Refrigeration Systems
Sewing Machines
Stitchers
Vacuum Cleaners
Vacuum Stills
Washing Machines

ELECTRICALLY HEATED DEVICES

Disc Stoves
Heaters
Hot Plates
Irons
Pressing Machines
Puff Irons
Stoves
Tailors' Laundry Irons
Vat Heaters
Water Heaters

SIGNALING DEVICES

Annunciator Systems
Burglar Alarms
Code Calling Systems
Fire Alarms
Pushbutton-Buzzer Calls
Tank Level Alarms
Temperature Alarms
Telephone System
Time Clocks and Stamps
Timing Signals
Vault Pilots
Watchman System

LIGHTING RECOMMENDATIONS

Advertising
Color Matching
Exit Signs
Explosion Proof Fixtures
Floodlighting
Inspection
Invisible Ink Identification
Night Lights
Outdoor Signs

A general lighting intensity of 10 f.c. in the shipping, receiving and washrooms, is recommended. For the office, store area and finishing room, provide at least 20 f.c. Good supplementary lighting of 100 to 150 f.c. is required for spotting, inspection and repair work.

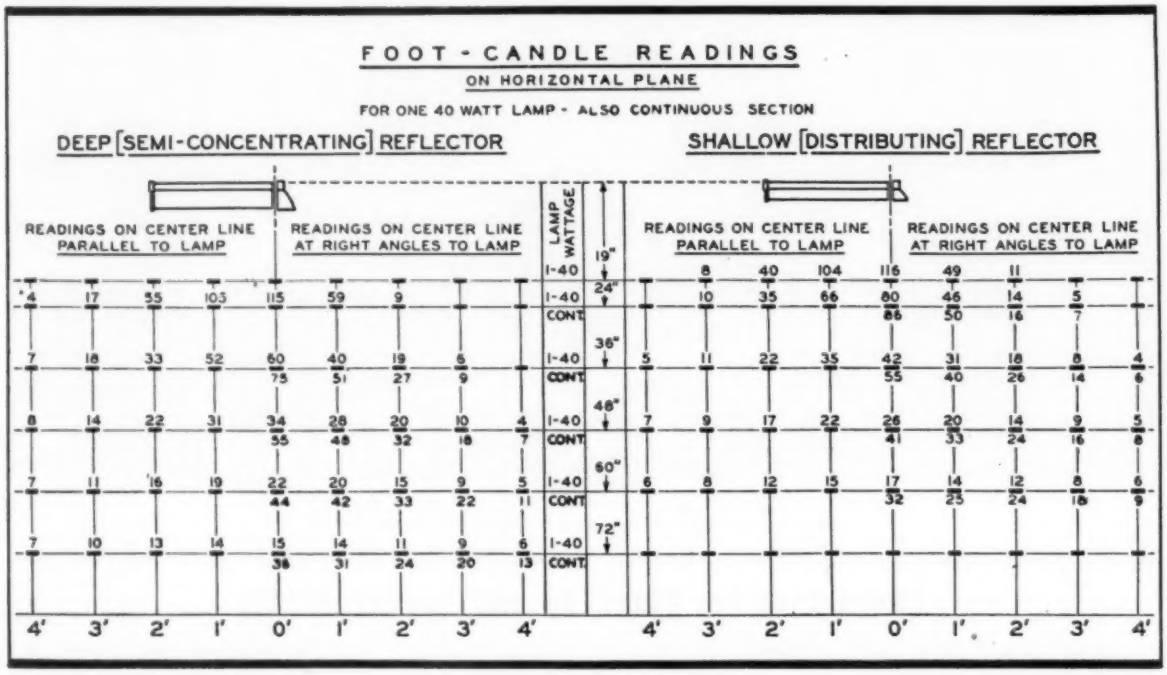
Fluorescent Lighting

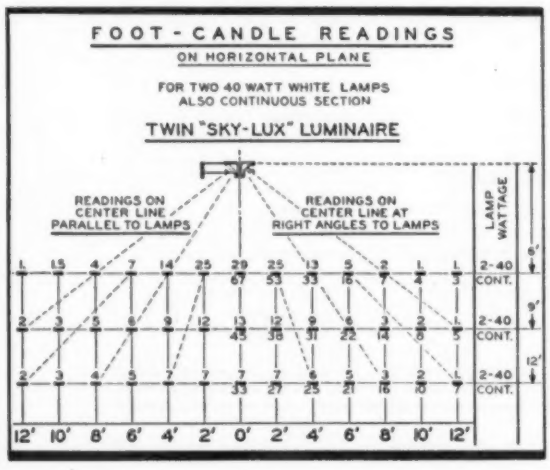
Second in a series of articles on the design, application and installation of fluorescent lighting. This article covers both the differences between fluorescent and incandescent lighting, and the ways they can be combined.

ANY attempt at this early stage in the art of fluorescent lighting to accurately prescribe and define its field of application would be impractical. It is only through years of expert engineering, salesmanship and public reaction that such an important development can be measured and intelligently projected.

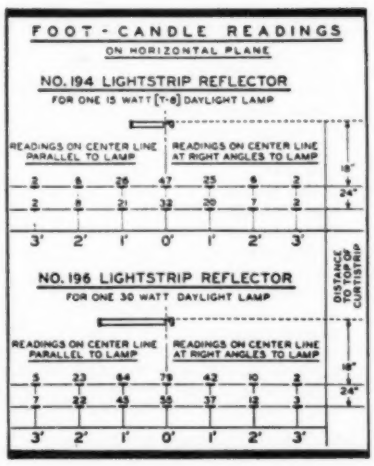
The introduction of fluorescent lighting provides the industry with a versatile new light source which brings with it some novel problems. Fortunately, the basic factors of good incandescent lighting remain the same with this new lighting.

1. *Intensities*—For six years the electrical industry has promoted better lighting with phenomenal results. Recommended standards of illumination have been widely accepted by the public. These standards gave practical, economical levels of illumination that could be produced with commercially available lighting equipment. Fluorescent lamps have radically extended the older ranges of illumination levels to




FOOT - CANDLE READINGS
ON HORIZONTAL PLANE
FOR TWO 40 WATT WHITE LAMPS
ALSO CONTINUOUS SECTION
TWIN "SKY-LUX" LUMINAIRE
READINGS ON CENTER LINE PARALLEL TO LAMPS
READINGS ON CENTER LINE AT RIGHT ANGLES TO LAMPS
LAMP WATTAGE
2-40
CONT.
12' 10' 8' 6' 4' 2' 0' 2' 4' 6' 8' 10' 12'

CALCULATING SUPPLEMENTARY *fluorescent lighting is made easy with these point by point charts. These charts were prepared by Curtis Lighting Inc. for equipment manufactured by that company. Similar charts are available from other manufacturers of fluorescent lighting equipment. Chart above gives foot candles reading for conventional single lamp reflectors. The readings are based on the use of daylight lamps. Chart at right gives readings for a compact lighting strip. Chart at left gives readings for commercial type general lighting unit employing two open lamps protected from view at normal angles with a louvered strip.*


FOOT - CANDLE READINGS
ON HORIZONTAL PLANE
NO. 194 LIGHTSTRIP REFLECTOR
FOR ONE 15 WATT [T-8] DAYLIGHT LAMP
READINGS ON CENTER LINE PARALLEL TO LAMP
READINGS ON CENTER LINE AT RIGHT ANGLES TO LAMP
18"
24"
3' 2' 1' 0' 1' 2' 3'
NO. 196 LIGHTSTRIP REFLECTOR
FOR ONE 30 WATT DAYLIGHT LAMP
DISTANCE TO TOP OF CURTISTRIP

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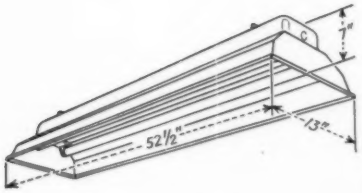
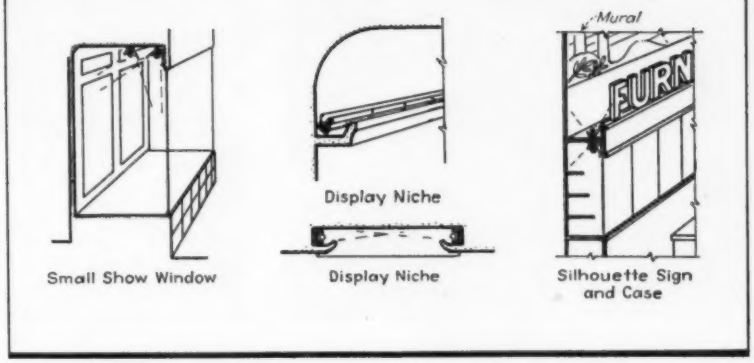
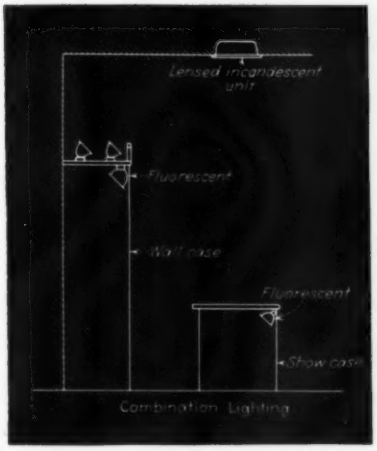
Application



RLM STANDARD *units are available from many manufacturers and designed for general industrial use. The unit employs two 48-in., 40-watt lamps in an efficient reflector with a high power-factor ballast enclosed in the hood.*



APPLICATIONS OF *concealed fluorescent lighting.*



COMBINATION OF *indirect fluorescent and direct diffused incandescent general lighting. Supplementary show case lighting is fluorescent.*

which the industry has grown accustomed. They give new values to offer the ultimate consumer.

2. *Layout*—In the development of modern lighting, the trade has become used to the functional approach. It has adopted reasonable standards of lighting intensity and quality for each job, and has then worked out what was needed in the way of luminaires, outlet locations and wiring. To the electrical industry light has become a commodity in itself.

This same technique is perfectly adapted to the sale and design of fluorescent lighting. The light source is new, the characteristics of the luminaires are different from those of incandescent lamp units, but the basis of the lighting problem is exactly the same: a given quantity and quality of light in a given area.

3. *Decorative Qualities*—Even when high levels of illumination became technically practical, there were many places in residences and commercial buildings where it was not desirable. In restaurants, lounge rooms, lobbies, theaters and similar places the quality and decorative effect of the lighting installation had more weight than lighting intensity. Fluorescent lighting has greatly expanded the range of decorative effects available in low intensity installations.

The satisfactory application of fluorescent lighting is far from a routine job at this stage of the game. Some very interesting problems can be solved, however, by a sound understanding of fluorescent characteristics and the ways in which incandescent lighting can supplement it.

The principle of lighting with incandescent lamps involves sources which deliver from 5,000 to 33,000 lumens. Fluorescent sources of low output (a 48 in .white lamp is rated at 2,000 lumens) obviously will have to be applied in a different way. Furthermore, fluorescent lamps give toroidal light distribution, as compared to the traditionally spherical distribution of incandescent lamps.

For high level general lighting in industrial application a large number of units on close spacing are required. This will be obvious by comparison with incandescent lighting installations. A 200-watt incandescent lamp produces approximately 3400 lumens. Two 48-in. daylight lamps produce approximately 3200 lumens. Thus it is apparent that the number of fluorescent fixtures required would approximately equal the number of 200-watt incandescent units needed for same general level of illumination.

Under average conditions, for example, RLM standard fluorescent lamp fixtures with two 40-watt 48-in. lamps mounted 8-ft. above the floor on 8 by 8-ft. spacings will produce approximately 20 foot candles of illumination. It is considered, however, superior practice to install the units in parallel rows, the lamps end to end, with the minimum end to end spacing that will allow good distribution between rows. If daylight lamps are replaced by white lamps the intensity will be 25 per cent greater or 25 foot candles in the above instance.

Commercial general lighting fixtures for use with fluorescent lamps fall into three general classifications; open, louvered, diffused. The open type fixtures employ exposed lamps, singly or in groups, against a reflecting surface. The lamps are usually supported in a horizontal position but some designs employ groups of lamps mounted vertically with a center reflecting medium.

Louvered types of units employ parallel strips that prevent direct view of the lamp from the side at normal angles and the "egg-crate" louver which blocks direct view of the lamp at normal angles from all directions. The diffusing type of unit, usually designed for flush mounting, employs lightly etched glass as a diffusing medium.

In commercial lighting installations exceptional results have been obtained with combinations of incandescent lighting at intensities of 25 to 40 foot candles plus fluorescent lighting in showcases and wall niches.

Another combination that has proved effective uses indirect fluorescent lighting in coves and above cases, fluorescent show case lighting, and high intensity incandescent down lighting from lens units set flush in the ceiling.

While show case lighting has produced some splendid examples of fluorescent lighting technique, window lighting has proved more difficult. But, window lighting in city shopping districts had reached high illumination levels before fluorescent lighting was available. To approach these intensities requires three, or more, parallel rows of fluorescent lamps in well designed reflectors for a shallow window.

Very effective window lighting installations have appeared in metropolitan centers which employ fluorescent lighting for color "washes" and background effect, with high intensity spot lighting from incandescent sources for sparkle and "punch".

Well designed fluorescent lighting jobs offer the contractor one of the greatest business opportunities in a decade. The best jobs will be installed by contractors who start from a thorough understanding of lighting principles, and a sound appreciation of the advantages, and the limitations, of all light sources.

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SOUND EQUIPMENT:—*Portable sound equipment converted this coupe into a sound car which found numerous applications at the Cooperstown Centennial.*

SOUND WIRING *is permanent and installation of equipment involves erection of loudspeakers and plugging in various part of system.*

Money in Amplifier Systems

Cooperstown Contractor sells permanent wiring for ball park and rents public address system when it is needed

By Raymond Kniskern
Cooperstown Electric Co., Cooperstown, N. Y.

MANY contractors have shied away from undertaking sizable installations of public-address systems, feeling this to be a field calling for intense specialization. They may be interested in the experience of our company in its initial plunge into this type of work.

The occasion was a several-day celebration of the 100th Anniversary of baseball in Cooperstown which was its birthplace. Much of the celebration was to take place in the local ball park, including games by big-league players and speeches by Postmaster General Jim Farley, Baseball Commissioner Landis and others. A suitable public address system became an imperative necessity.

In cooperation with the manufacturer, sufficient information and advice was presented to permit the requirements and costs to be figured accurately.

The permanent wiring layout consists of two microphone cables run in conduit from the microphone location in one of the front boxes to the amplifiers located at the top rear of the stand. One was for regular and the other for emergency use. From here two pairs of No. 14 wire extended in conduit to the end of the grandstand, then underground in BXL to a point directly below the loudspeaker platform erected at the rear top of the bleachers opposite third base, then up to this platform in conduit. One pair supplied the loudspeakers. The other pair was a spare.

The equipment includes microphones located in the announcers box and at home plate, a 70-watt Clarion C-39 amplifier, 30-watt C-26 reserve amplifier and four Type HWAW air column loudspeakers. Flexible microphone cables connect in at a 4-in. x 9-in. junction box located in the announcers box. The 250-ohm output of the amplifier feeds into the loudspeaker line, then through individual line-to-voice coil transformers into the four loudspeakers. The latter are mounted pointing in different directions to provide complete coverage of the entire seating arrangement.

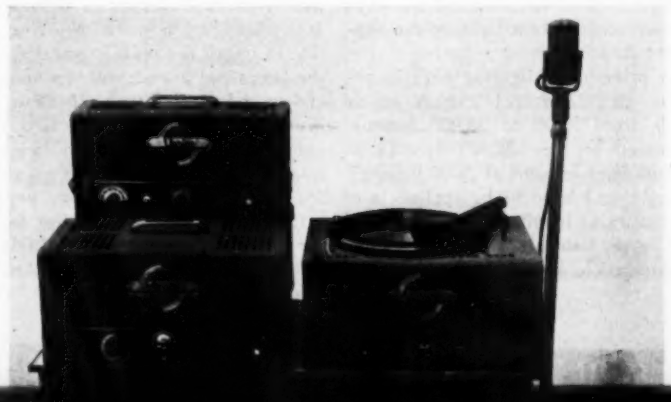
In addition, a separate system was installed in a coupe to serve as a mobile unit. It consisted of a Clarion C-32 universal 20-watt amplifier which operates either from the a.c. line or a 6-volt car battery, a hand microphone, phonograph record player and two dome-baffle loudspeakers. This was used in the parades, as an aid in handling traffic during the celebration and for general advertising of the celebration outside the ball park.

We were not entirely without experience in the sound systems field, having made several smaller installations before which had brought conviction on two points. First, that complete sound installations are distinctly within the province and ability of the electrical contractor. Second, that this extension of the contractors field is worthwhile from the standpoint of the annual balance sheet.

Due to the vast crowds here on all days of the big games some very valuable advertising was secured. It will result in the use of our equipment at various other Fairs and social functions in this vicinity.

Sound equipment on the market today is not a miscellany of microphones, amplifiers and loudspeakers which must be separately purchased and "matched" by the installer. We used a completely coordinated system in which all detailed technicalities are taken care of by the manufacturer. It seems pointless for us to undertake only the permanent wiring when we could realize a profit on the equipment itself as well. So we did. For those who haven't tried it here is something worth investigating.

SOUND SYSTEMS:—*Three portable amplifiers carried in stock by Cooperstown Electric Company, ready to meet the sound coverage requirements of any job, from a great stadium to mobile "ballyhoo" were all used at the celebration.*



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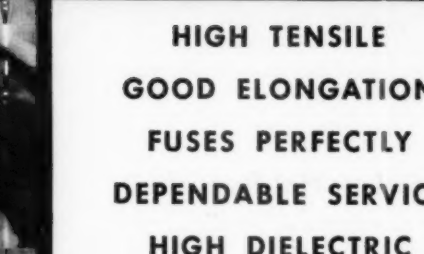

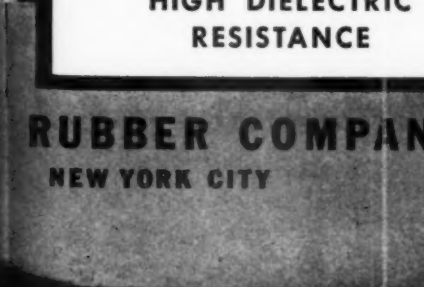

Earl Whitehorne, Editor

Problem In Selfishness

Rewiring with the new small diameter wires is building up a bugaboo that needs to be knocked down hard. Already some people are saying that if the new wire is good enough for rewiring jobs it is good enough for new construction. The point is made that legally there shouldn't be any distinction between the two kinds of work.

As sound business men, we certainly ought to take a definite stand and strongly oppose the unnecessary filling up of conduits on new jobs. If we don't take this position we are sure to find that in another ten years the growth in electrical applications will present a serious problem just as it does in older buildings today—but if we have already filled conduits up with the new small wires we won't be able to do anything about it and we'll lose a lot of business that should rightfully come our way.

It's a problem in selfishness all the way around. The builder of a new structure may want to keep his cost down to bed rock. But we owe a duty to both the future owners of such buildings and to the entire electrical industry to do everything in our power to see that enough conduit capacity is built into these buildings from here on so that if they need more circuit capacity in the future they can get it. This is an all-industry problem, but it's one over which the contractor can be a watchdog and at the same time serve his own individual interests.

We think the whole construction industry ought to take cognizance of this problem. That goes for realty interests, the utilities, architects, and engineers as well as electrical contractors.

Exit For Black Pipe

For a long time electrical contractors, wholesalers and inspectors have been calling for the elimination of black conduit. It duplicates stocks, confuses specifications and ought to be barred by the Code, they say.

But though the new 1940 Code does place additional limitations on the use of black enameled conduit, the question here is one of standardization, not of safety. The use of black enameled conduit has already dropped to 20 per cent of all conduit used. The percentage can be further reduced if electrical contractors will quit using it. Also, local contractors associations can adopt the working rule that all job specifications require galvanized conduit unless black is definitely specified. Also, wholesalers can place a duplicate stock charge on black conduit to further reduce the difference in price.

But a far easier way has been pointed out. NECA, at Philadelphia, authorized an industry conference to study the problem of excess and duplicating varieties of wiring materials and equipment. It can be done under the sponsorship of the Department of Commerce and made legal. Black conduit would probably receive early attention.

Adequacy Sacrificed

A recent report reveals the intention of the USHA to trim the electrical work in its projects. A recommendation suggests limiting the outlets per room to one standard receptacle and one combination bracket light and convenience outlet.

This is below "bare necessity" requirements and if this recommendation is approved these dwellings, from the day they are occupied, will be electrically obsolete. If these projects are to have a useful life of 60 years, as called for in the loan contracts, they're going to need more "electrical livability" than this limited wiring scheme provides. And fewer outlets will encourage "home made" extensions to lamps and appliances, overloaded circuits and increased hazards—not a pretty picture for a new building.

It's unfortunate that these projects should sacrifice electrical adequacy, when the electrical work is such a small portion of the entire project cost; when lighting and appliance standards are increasing annually; when people are being educated to adequate wiring and when low cost houses are being built with at least three convenience outlets per room.

The one-outlet-per-room era is past and should not be revived, especially in new buildings. Local housing authorities should be the last to sanction these reductions—for first cost isn't final cost to them. The entire electrical industry should voice its objection, and offer sound reasons for opposing the USHA proposals. Let's not lose what we have gained.

Spring Check-Up

Spring is here—and it presents a fine opportunity for us to approach our customers, both commercial and industrial, and propose a general checkup on their electrical systems. For after the long hard winter months of continuous service, the electrical system is bound to need a bit of sprucing up here and there. And now, when the days are longer and the load is less, is a good time to make that department change or enlarge the system to handle the electrical adequacy that was lacking during the winter.

It's a chance for us to take out our instruments and begin making that annual checkup. And there's no reason for us to "miss the boat." So let's get busy and chances are that we'll be kept busy.

Ohm's Law Not Repealed

The new National Electrical Code seems destined to set up new carrying capacities for wires. But before we get ourselves all tangled up in these new amperage ratings, let's get one fact clear. Just because the new Code lets a conductor carry 20 am-

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peres that a year ago could carry only 15 amperes doesn't mean that we ought to take advantage of that new rating on every job.

Ohm's Law still reads: E = IR. And since the resistance of a given size and length of wire hasn't changed, a 33⅓ per cent increase in current can only mean one thing—a 33⅓ per cent increase in voltage drop.

Let's not lay out jobs with the new wire capacities and forget about voltage drop. Check every circuit, if necessary, because Heaven knows we ought to be working toward smaller rather than larger voltage drops. Let's be conservative in applying the new Code—our whole industry and the public will benefit from that policy.

Auxiliaries

Some contractors have been buying fluorescent fixtures complete with auxiliaries. Others have been buying them bare, and installing auxiliaries of their own choice. There's a lot to be said for both methods.

But in the rush for this new business let's not forget that auxiliaries are the heart of the fluorescent job. If either manufacturer or contractor buys these items just on price there may be headaches ahead. Condensers can puncture, chokes can burn out, and switches can break down both mechanically and electrically.

It's bad business to save a dollar on auxiliaries today, only to spend ten dollars during the next year on trouble calls. Maybe good customers will be lost, too.

In self-defense, we ought to know all about the auxiliaries in every fixture we install. Who is the manufacturer? What kind of a guarantee do they carry? What sort of minimum standards does the manufacturer meet?

As an industry we haven't had enough experience to measure either the probable frequency or the cost of service calls. So until we know just what we're up against we might well buy with wide open eyes and our mouths full of question marks.

Opportunities In Infra-Red

Successful use of radiant heat for industrial drying, heating, baking, and dehydrating has created a new market for the electrical contractor. Infra-red drying is accomplished by passing the material to be dried under banks of infra-red ray lamps.

The necessary equipment is relatively inexpensive and an effective working demonstration kit of five or six lamps will find jobs in many plants.

Infra-red ray heating is an important new field and the time to get in on the ground floor is now.

"Pet Peeves"

A statement in an EEI booklet listed insufficient outlets for electrical appliances as ranking second among the "pet peeves" of apartment dwellers. Lack of closet space was the first on the list. Undoubtedly "pet peeve No. 2" exists in many homes also.

We electrical contractors can't do anything about the closet space but when it comes to convenience outlets —that's right up our alley and we should do something about it. Let's go out to erase this pet peeve from the home owner and apartment dweller list and increase the number of adequately wired dwellings. It's all "plus" business for us and it may even lead to a general check-up job.

Back Talk

Sales Help

To the Editor—"I have been very much interested to read your editorial in the March issue of *Electrical Contracting* entitled 'No Flea Circus'. I believe there is a thought here for all of our sales people with regard to the proper method of presentation of a sales story to the prospect.

"I would like to get about 65 copies of the reprint of this editorial if they are available."

P. M. Alden, Manager Retail Sales
Philadelphia Electric Co., Philadelphia

Thank you, Mr. Alden. We are glad to send you the reprints for your sales people. You and your organization are welcome volunteers in the campaign to "Sell Up."

Re—"Our Proud Whistle"

To the Editor—"This is to congratulate you on the ever increasing size of *Electrical Contracting* and the better and better articles every issue.

"Especially fine is the editorial 'Our Proud Whistle' wherein you suggest the idea of cutting out all unnecessary duplication of materials.

"I have before me a manufacturer's catalog just received and showing on one page are fifteen types of attachment plug caps, besides at least 25 other kinds scattered throughout said catalog. This continues throughout the catalog.

"It seems to the writer that with the magazine you have and the distribution that goes with it that you could be the one 'to start something'."

Norton Frierson
Savannah, Ga.

To the Editor—"In my opinion 'Our Proud Whistle' is a splendid editorial because it is jammed full of common sense.

"You are right—simplification and standardization *is* the real key to lower wiring cost, and the beauty of it is lower cost and safety standards can be obtained and retained through this approach.

"Of course, the present complicated wiring materials mess is a shield for those who want to use it to hide shady commercial and installation practice, but even they would benefit in the end through simplification and standardization."

O. A. Frederickson, Commercial Engineer
National Electric Products Corporation, New York

To the Editor—"Your article in *Electrical Contracting* for April, 'Our Proud Whistle', expresses our views in this matter exactly.

"Couldn't you draw some comparisons of what has been accomplished in simplification through a study of the bolt and nut situation as well as the end wrench industry? We believe you will find here the most outstanding accomplishments of anything that has been done to date.

"We want to assure you of our interest and if we can be of any help please do not hesitate to call upon us. We want to reduce the number of items we regularly stock about fifty per cent."

H. O. Smith
The Hardware & Supply Co., Akron

To the Editor—"I am particularly impressed with your editorial 'Our Proud Whistle'. The multiplicity of wiring devices is a particular problem of the distributor. Two factors have brought this about. The principal one being the effort of the manufacturers to have something new to sell around which to build a selling talk for their line in general, but if black conduit and boxes could be completely eliminated I think both the manufacturer, distributor, contractor and customer would be better off. The manufacturers' catalogs grow bulkier each year for they retain almost everything of their old line in addition to adding many new ones.

"In a typical catalog there are a hundred items or more which could be eliminated as out-moded for they have been superceded by more modern design of far better material. We have many orders from day to day for a dollar or two of old style materials to "replace' a worn out item which the contractor who is doing the work should replace with a more modern switch or receptacle or socket. In the course of a year several hundred of these no profit orders go through the house. The items take from ten days to two weeks to secure and meanwhile the contractor and the customer are marking time when a modern tumbler switch or a modern receptacle could have been put in to do a better job than the old style piece which is coming from the factory. It seems to me that something could be said along this line through your pages to the contractors."

Melville B. Hall, President
Malville B. Hall, Inc., St. Louis

To the Editor—"I wish to comment upon your signed editorial appearing in the April issue. A movement to simplify, modify and narrow the choice of the various items with the object to eliminate the great number of duplications now existing in our business is long overdue. The condition is not improving. It is, in fact, becoming worse with almost every month. The manufacturers seem to be primarily interested in sales and have not given sufficient attention to eliminating old items which have been replaced, for the better, by newer items.

"Improvement has also been handicapped by the slavish obedience to customer demand for items, which because of new and improved products, should no longer be used.

"We believe a movement by the electrical contractors', wholesalers' and manufacturers' associations for a program of simplification through the Bureau of Simplified Practice in Washington would produce as good results as it has in other industries."

Samuel Kaplan
Belasco Electric Supply Co., Chicago

Many letters have come in commenting on this editorial. They all agree that something should be done towards reducing the line of wiring supplies. We hope the electrical industry will take action.

WIRING Methods

ROLLING LADDER

The T. L. Rosenberg Co., industrial electrical contractors of Oakland, California, has designed a rolling platform and wood tray which can be quickly assembled and attached to an "A" ladder on the job. The ladder, so equipped is used mounting fixtures in large industrial and commercial areas and in mounting holiday lighting strings along streets.

***PORTABLE LADDER** on casters, rolls smoothly along and speeds up fixture hanging, ceiling drilling and other work in high places.*

The platform consists of two wood strips with casters attached. The feet of the ladder have right angle metal plates, with a retaining lip, bolted to them. The other side of the plate is bolted to the caster strip. Four cross strips keep the ladder extended and help keep it rigid. Two of these strips fit snugly between the ladder feet and are bolted parallel to the caster strips. The other two are the same length as the maximum ladder spread and are bolted at right angles to the caster strips. The use of wing nuts on these strips permits easy dismantling and portability.

The wooden tray is fastened to the top of the ladder by battens and held by wing nuts. This tray is used for holding tools, lamps, fixture parts and accessories.

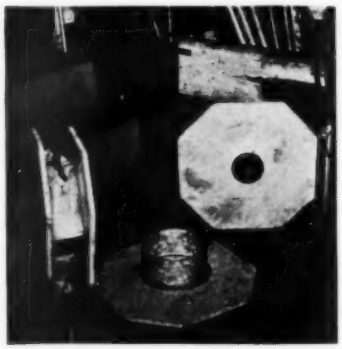
By using this method, one man can remain on the ladder constantly, hanging fixtures, while a second remains on the ground, assembling fixtures and pushing the ladder from outlet to outlet. The time ordinarily wasted in climbing up and down and lifting the ladder to new positions is saved.

SMALL-DIAMETER WIRE REELS

For handling and protecting small diameter wire on the job, William Wachter of Wachter Electric Company of Kansas City, Missouri has built a number of special reels.

The sides of the reels are made from ¾-in. plywood, 24-in. wide and cut in an octagonal pattern to prevent free rolling. Two common floor flanges and a short nipple makes the spindle. A tin sleeve nailed to one side just fits inside of a standard coil of small diameter wire.

The coil is placed over the tin sleeve without removing the paper wrapping from the wire. The other side of the reel is screwed up tightly against it.



***WIRE REELS** for coils of new small diameter wire tightly grips the coil, will not roll. At left is an assembled spool, the open reel shows the construction.*

METER BOARDS

The appearance of service switch installations is often spoiled by a haphazard job on the meter board on which the equipment is mounted. The Scott Electric Company of Memphis, Tenn., takes great pride in the fine workmanship of their service entrance assembly and have recently standardized on "masonite" mounting boards.

The material is purchased in large sheets 4-ft. wide, cut on the job to appropriate size and finished off with a neat 2- by ½-in. molding around the edge. The reddish-brown natural finish is left unpainted as the surface is already impervious to moisture.

***METER BOARD** of ¼ masonite provides a neat and sturdy backing for service equipment.*

In the installation of service switches and distribution panel equipment in a Memphis apartment building, five panels 6-ft. high by 4-ft. wide were used covering part of two walls of the meter room.

CONDUIT BENDING

M. B. Foster Co., electrical contractors of Boston, are doing the work on a large low cost housing project. A job of this type requires efficient shop methods in making the bends in numerous conduit runs.

To accomplish this they have set up, in their field shop, a "hickey" type conduit bender which gives perfect 90 degree bends, all uniform and of the same riser height. The bender is mounted on a 2-inch by 9-inch wood plank which is fastened to a wood framework. This framework is firmly nailed to the floor. A wood block mounted at the head of the bender contains nail stops which halt the conduit as it is pushed through the bender. The distance from the

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16 ADVANTAGES OF HAZAKROME TYPE SN SMALL DIAMETER BUILDING WIRE

Re-wiring Existing Raceways Practical with HAZAKROME Type SN

For maximum loads combined with ease of installation, permanance and safety use HAZAKROME Type SN Small Diameter Building Wire and obtain these 16 advantages.

1. A wide range of sizes (14 to 4/0) for both lighting and power circuits.
2. No braids or other fibrous coverings needed.
3. Insulation that will not deteriorate in air or sunlight.
4. Insulation that is non-inflammable.
5. Insulation that is oil resistant.
6. Smooth, glossy, lubricated surface makes pulling easy.
7. Small diameter takes up less room in conduit.
8. Can be operated at a copper temperature of 60° C.
9. Resists moisture, acids and alkalies.
10. Greater current carrying capacity.
11. Free stripping to make splicing and soldering easy.
12. High dielectric strength (over 700 volts/mil).
13. Tough insulation has tensile strength of 2000 lbs. per sq. in.
14. Will not readily collect dust and dirt.
15. Insulation is chemically stable and long aging.
16. Non-fading colored insulation for circuit identification—same color range as on Type R wires.

1. SMALL DIAMETER

Comparative Outside Diameters

A. W. G. SIZE	Ordinary Type R Building Wire Approx. O.D. Inches	HAZAKROME Type SN Small Diameter Approx. O.D. Inches
14 sol.	.190	.130
12 "	.210	.147
10 "	.230	.168
8 "	.280	.227
6 str.	.380	.314
4 "	.450	.363
2 "	.510	.423
1 "	.570	.496
1/0 "	.630	.537
2/0 "	.670	.583
3/0 "	.730	.634
4/0 "	.780	.692

The 60° C. maximum recommended operating temperature of HAZAKROME Type SN as against 50° C. for ordinary Type R wire means greater possible current loadings (see adjacent table).

2. GREATER LOADING

Comparative Current Loadings

A. W. G. SIZE	Ordinary Type R Building Wire — Amperes	HAZAKROME Type SN Small Diameter — Amperes
14 sol.	15	18
12 "	20	23
10 "	25	31
8 "	35	41
6 str.	45	54
4 "	60	72
2 "	80	96
1 "	91	110
1/0 "	105	127
2/0 "	120	145
3/0 "	138	166
4/0 "	160	193

The values shown above are for 1, 2, or 3 conductors in a single conduit as proposed for the 1940 National Electrical Code.

3. LARGER CONDUIT FILL

% Area of Conduit

Type of Insulation	Number of Conductors 1	2	3	4	Over 4
Ordinary Type R	53%	31%	43%	40%	40%
HAZAKROME Type SN	60	40	50	50	50

As proposed for 1940 N. E. Code

Before	NOW Increased Conduit Capacity		
Ordinary Type R Building Wire	HAZAKROME TYPE SN Small Diameter Building Wire		
3450 WATTS 4 No. 14 Individual Neutral	**5700 WATTS** 4 No. 10	**5800 WATTS** (or 8 No. 14) Individual Neutral	**6350 WATTS** (or 6 No. 12)

The Hazard Kit of Samples and complete information will help you sell re-wiring jobs. Write for it today.

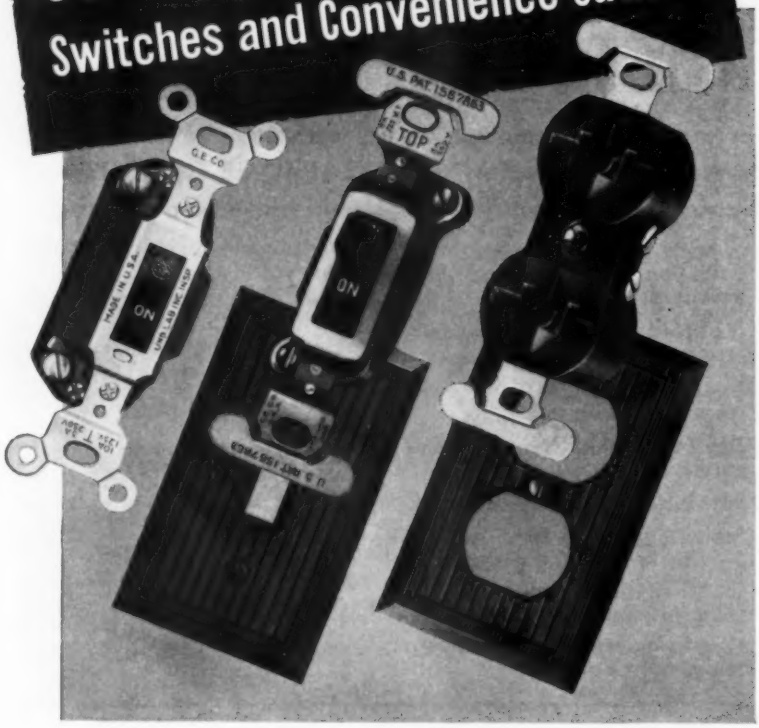
HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

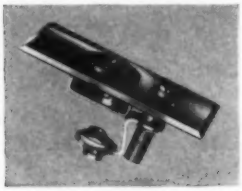
New York Chicago San Francisco St. Louis
Philadelphia Atlanta Dallas Los Angeles Detroit Boston
Washington Seattle Cleveland Pittsburgh Buffalo

USE G-E HIGH QUALITY
Switches and Convenience Outlets



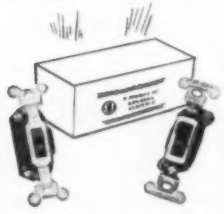
Be sure the wiring devices you install are equal in quality to the rest of the wiring. These devices are about the only part of the wiring your customers see and they are apt to judge your work by them.

There are two lines of modern G-E switches—the Sphinx Silent Switches and G-E Standard Switches completely insulated with Textolite. Standard G-E Convenience Outlets are made of Textolite with easy finding slots.



SPECIAL PURPOSE OUTLETS

Clock hanger outlets, radio outlets, weatherproof outlets, fan hanger outlets—can be added to most home wiring jobs, even to those that, for all general purposes, are completely adequate. Other outlets providing extra convenience include the G-E Twist-Tite twin outlets and separate-feed twin outlets which permit one of the outlets to be controlled by a switch.



G-E SWITCH PACKAGE

This package, GE3316, contains 50 G-E Standard and 15 G-E Sphinx switches plus an action display. It will help you in demonstrating and selling "First Line" quality switches.

For further information about G-E switches and outlets see the nearest G-E Merchandise Distributor or write to Section D-0125, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

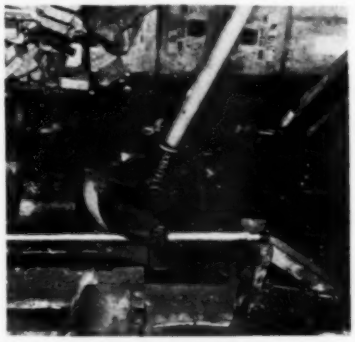
GENERAL ELECTRIC

WIRING Methods

[FROM PAGE 24]

bender to this stop gives the riser height of the bend. For higher risers, more blocks are added to the outside of the present one. For shorter risers blocks are added to the inside of the present one.

The bender itself has a long pipe lever arm which makes bending easy. Adjustments on the bender, which takes



STOP BLOCK for an adjustable conduit bender assures perfect, uniform sweeps and riser heights and saves considerable time in the bending operation.

½-inch and ¾-inch conduit, permit bends up to 90 degrees; also long or short sweeps.

Once the bender and block adjustments are made it is a simple matter to bend several hundred lengths of conduit, such as are needed on housing projects of this type, where conduit runs for each floor are identical and where outlet height is standardized. And this means a substantial saving in labor.

DIMENSIONS SAVE TIME

On a recent housing project where a number of units were identical, the Keystone Engineering Corp. of Reading, Pa., made field drawings of the unit, giving full dimensions necessary to spot outlets or center lines of partitions. All dimensions were taken from the outer edge of outside walls for accuracy.

Giving definite dimensions is an important labor saver, since the mechanic on the job need not bother with "scaling off" outlets and other important dimensions. And the "conversion error" in scaling is eliminated. Also the small blueprints of each section are easier to handle and read than the larger prints containing all the units.

Although it takes time for the engineer in the office to make these drawings, the labor saved on the job and the lack of confusion more than pays for it.

Insure Your FLUORESCENT LAMP INSTALLATIONS—with

JEFFERSON BALLASTS and AUXILIARIES

Where daylight illumination pays big dividends—in tool rooms, manufacturing departments, drafting rooms, over inspection tables, and in offices—the application of fluorescent lighting is rapidly increasing—giving much better light and with much less heat radiation.

To insure satisfactory, trouble-free performance, the Ballasts and Auxiliaries required for fluorescent lamp operation must be engineered and constructed to meet the requirements exactly.

Research and experimental work carried on in the Jefferson Electric plant since the first use of fluorescent lamps—and the more-than-25 years' experience of Jefferson with transformers for mercury lamps, neon tubing, street lamps—insure reliable Fluorescent Lamp Control Equipment for satisfactory lamp performance. Tens of thousands have been put into service during the past year.

Advice on fluorescent lamp problems is available at all times. Write for Bulletin 401FL.

JEFFERSON ELECTRIC COMPANY
BELLWOOD, ILLINOIS
Canadian Factory: 68-84 Oxley Ave., W. Toronto, Ont.

JEFFERSON
FLUORESCENT LAMP
BALLASTS AND AUXILIARIES

NEW! 5° ANGLE COUPLINGS

ORANGEBURG *perfects* *another* SAVING IN INSTALLATION

NOW you can avoid obstacles, and make bends, swings and offsets of varying size . . . on the job . . . in the field.

. . . get absolutely water-tight ORANGEBURG "quality" joints . . . at a fraction of the cost of special bends or ells . . . with the new, simple, inexpensive Orangeburg 5° Angle Coupling. (Available as stock items, either Orangeburg Standard or Nocrete).

. . . at only double the regular (straight) coupling price.

NOCRETE

Try it now, for anything from an industrial power, lighting or signal service, to a house connection, garage or barn hook-up! NOCRETE is built for installation underground without concrete encasement.

STANDARD

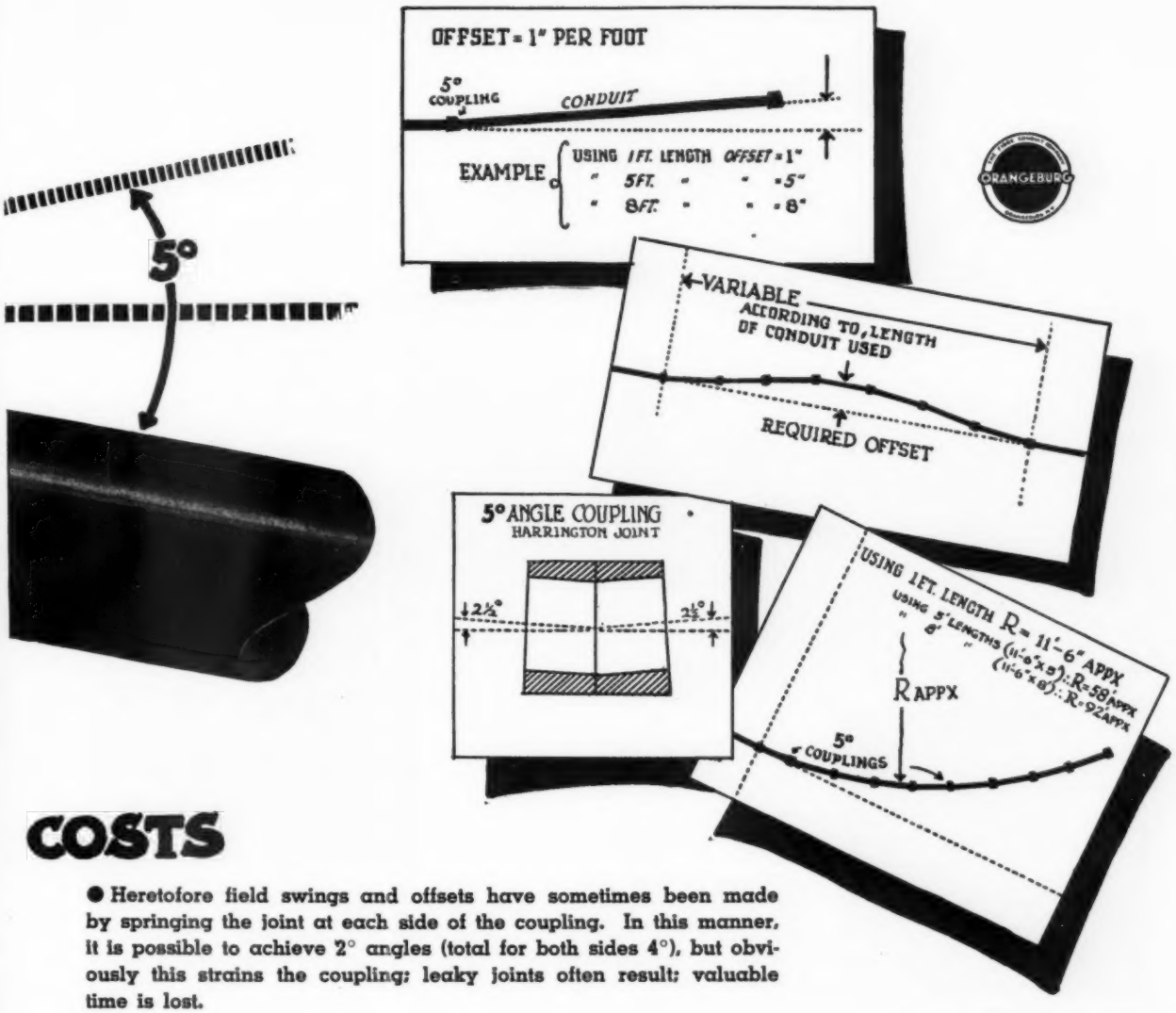
For a duct-bank job, a downtown or heavy-traffic location, use Orangeburg Standard installed with concrete encasement, and your profit margin will be assured.

The sketches on the opposite page show typical layouts with conduit lengths easily cut and tooled in the field . . . made possible by this simple yet important new Orangeburg feature. The new 5° Angle Couplings are another of those big little points that result in the utmost economy and highest quality . . . profit makers for you when you insist on genuine Orangeburg.

There are two extra profits for you in using Orangeburg NOCRETE on your installations underground:

1. New added savings in material costs.
2. New added savings in installation costs.

ORANGEBURG


OFFSET = 1" PER FOOT
5° COUPLING
CONDUIT
EXAMPLE
USING 1 FT. LENGTH OFFSET = 1"
" 5 FT. " " = 5"
" 8 FT. " " = 8"
5°
VARIABLE
ACCORDING TO LENGTH OF CONDUIT USED
REQUIRED OFFSET
5° ANGLE COUPLING
HARRINGTON JOINT
2½°
2½°
USING 1 FT. LENGTH R = 11'-6" APPX
USING 5' LENGTHS (11'-6" x 5') : R = 58' APPX
" 8' " (11'-6" x 8') : R = 92' APPX
R APPX
5° COUPLINGS

COSTS

● Heretofore field swings and offsets have sometimes been made by springing the joint at each side of the coupling. In this manner, it is possible to achieve 2° angles (total for both sides 4°), but obviously this strains the coupling; leaky joints often result; valuable time is lost.

● Now by providing a relatively small number of the New "Orangeburg" 5° Angle Couplings to go out "on the job", the man in the field can meet conditions as they arise without loss of time and still maintain highest quality standards.

● The 5° Angle Couplings are plainly marked with an orange stripe on the inside radius, thereby avoiding confusion with regular straight couplings and also indicating the "cock" of the 5° Angle at a glance.

Sales Agent—Distributors

GENERAL ELECTRIC SUPPLY CORP. **GRAYBAR ELECTRIC COMPANY INC.**

MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE., NEW YORK CITY

NOCRETE conduit assures you of:

1 *Savings in material costs*

Orangeburg NOCRETE conduit is about half the cost of metal pipe and less than non-metallic conduits of any comparable quality. Ask our representative for prices. Extra couplings and all types of fittings, ells, bends, etc., are available.

2 *Savings in installation costs*

It "handles easy"; light in weight, in handy 5 or 8 foot lengths (in various sizes) this super-sturdy duct will surprise you by its adaptability. It assembles and installs easier, faster and at a lower cost than any conduit you have ever used. It is readily cut and fitted with ordinary woodworking tools.

Approved by Underwriters' Laboratories, Inc. for installation underground (without concrete encasement) — Guide card 60-014 File E 2557

***Standard* for installation *with* concrete encasement**
NOCRETE for installation *without* concrete encasement

Motor Shops

HANDY STAND

The R. A. Reed Electric Company, Los Angeles, California, has designed a stand to support stators, tools and materials during the rewinding operation. It is waist-high and eliminates stooping.

The stand is constructed of an I beam with a channel welded to the top face of one flange and two channels welded to each side of the web and the inside faces of the bottom flange of the beam. The top channel supports the stator while the two lower ones serve as trays for tools and accessories. The entire assembly is welded to a steel pipe pedestal, which stands on the floor.

***STATOR STAND** made from "I" beams and channels, supports various sized stators and has tool and parts trays.*

After the job is complete the workman places his tools in the leather tool kit which he wears. Thus he has his tools handy for the next job that comes along.

ELECTRIC HEATER FOR SOLDERING IRONS

Two spring carbon contacts, complete with holders from an elevator switchboard, serve as the heating elements for heating soldering irons of various sizes in the shop of Walter J. Rider, Binghamton, N. Y. Two copper brackets hold the contacts in place, and a wire cradle holds the iron in place.

The spring feature of the contactors affords good contact and permits heating various sized irons. The heating device is connected to current transformers, connected as step up transformers to facilitate quick heating.

***CARBON CONTACT** electric heater for soldering irons. Spring contacts permit heating irons of various sizes.*

PARTS CABINET

H. A. Schreck of Henderson & Schreck, Inc., motor repair specialists of Mt. Vernon, N. Y., believes in conserving floor and wall space. The shop contains a cabinet, 26-in. deep, 31-inches wide and 7-feet 6-inches high, to house the hundreds of motor parts. The cabinet contains 84 drawers, each one having at least three compartments. Stored in the cabinet are 165 sizes of bearings, 108 sizes of carbon brushes and 80 various other replacement parts. The cabinet is conveniently located directly behind the main workbench.

***CONVENIENT CABINET** which contains more than 350 different types of motor parts, and requires little wall and floor space.*

INSTRUMENT DISPLAY

The Allied Electric Co., electrical contractors of Chattanooga, Tenn., capitalized on public curiosity about gadgets by displaying a window full of elaborate testing instruments.

The display consisted of a light meter, various radio test sets, sets designed for testing wiring systems, and industrial analyzers. All of the instruments are owned and regularly used by the company for residential, commercial and industrial service work.

***WINDOW DISPLAY** emphasizes instrument testing facilities of a Chattanooga electrical contractor.*

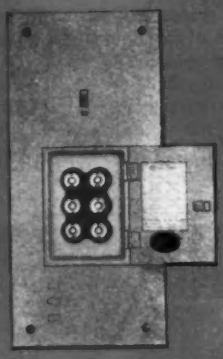
ISOLATED SHOP NEEDS LARGE STOCK

A contractor having a motor shop far from sources of supply of such items as special sizes of magnet wire for rewinding of motors has to provide a means of keeping an adequate supply on hand. Rowley Brothers Electric Motor Company at Casper, Wyo., is in such a position. The only motor repair shop within hundreds of miles, Marc Rowley has found it advantageous to keep such a stock on hand. In order to keep it in an orderly condition and accessible for rush job rewinding, a tree type rack shown in the illustration has been built at one corner of the shop. The spools of magnet wire are placed on the hori-

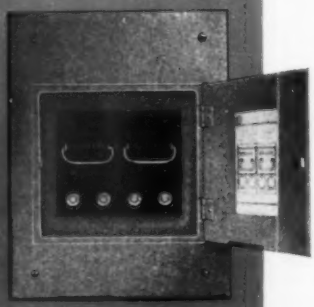
UMI

NOW...INCREASED DEMANDS ON BRANCH CIRCUITS OPEN UP A NEW FIELD

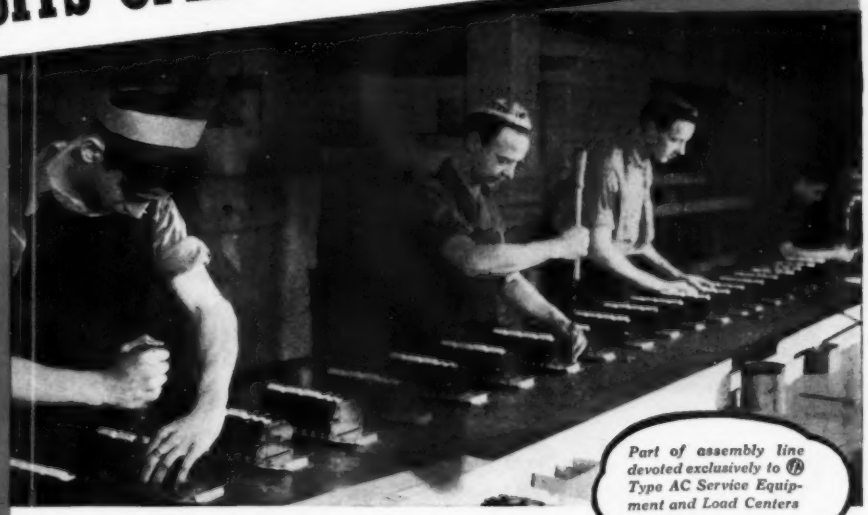
FA Service Equipment with 6 S. P., AC Circuit Breakers



FA 6-Circuit Safety-type Service Equipment, with 30 Amp. Unfused Tumbler Main Switch. Bell Transformer space and Switch knockouts optional.



FA Service Equipment with Pull-out Type Main Switch and Range Circuit, and four Lighting Branch Circuits.



Part of assembly line devoted exclusively to FA Type AC Service Equipment and Load Centers

In both new building and modernization, the question of adequate wiring presents new problems to the architect and the contractor. Thousands of new and remodeled homes will require the most modern types of service equipment, capable of carrying the heavier loads.

FA SERVICE EQUIPMENT

meets these needs perfectly — because FA Products *do not stop at minimum standards.* They are *built better than necessary* — and designed to be ornamental as well as practical . . . Due to a complete standardization of interchangeable units, these products — of the highest grade — are manufactured on a quantity basis, and therefore priced reasonably.

LET THE NEAREST FA SALES ENGINEER HELP YOU

Make it a practice to consult with him. The benefits of his long and specialized experience are yours for the asking. It is not unlikely that he can take work and worry from your shoulders, and help assure the estimated profits on many jobs. If you do not know where to find him, write us for his name and address . . . and ask for New Catalog No. 56 . . . Frank Adam Electric Company, St. Louis, Mo.

EST. 1891 THE SIGN OF A BETTER JOB

FA

Frank Adam

SERVICE EQUIPMENT

FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.

RUBBER COVERED POWER CABLES • BUILDING WIRE • VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE • CRESFLEX NON • METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

Get Your Quota

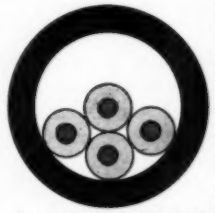
in the Profitable Rewiring Market with

CRESCENT Small Diameter Building Wires

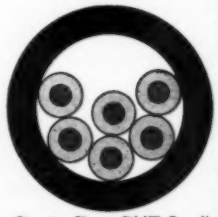
As you well know, the changes in the new National Electrical Code open up great profit opportunities for you in the rewiring of existing "bottle-neck" branch circuits with attendant increases in feeders.

For such rewiring, it will pay you to use CRESCENT ENDURITE Rubber Insulated Type RHT and CRESCENT SYNTHOL Synthetic Insulated Type SN SMALL DIAMETER BUILDING WIRES which are unexcelled in quality, ease of installation and permanence.

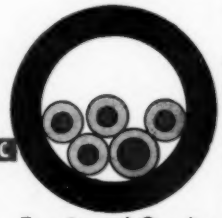
Two typical examples of the increase in capacity possible in existing ½" conduit are shown in the lower two figures at the right.



Four #14 Type R Code Wires permit 3450 Watts



Six #12 Type RHT Small Diameter Wires permit 7450 Watts



Four #12 and One #10 insulated neutral Type RHT permit 8100 Watts

CRESCENT INSULATED WIRE & CABLE CO. INC
TRENTON, NEW JERSEY

Atlanta Baltimore Boston Buffalo Chicago Cincinnati Cleveland Detroit Indianapolis Kansas City Los Angeles Minneapolis New Orleans New York Philadelphia Pittsburgh St. Louis San Francisco

CRESCENT ENDURITE SUPER-AGING INSULATION

Motor Shops

[FROM PAGE 30]

zontal "limbs" as shown. It is a simple matter to draw down a strand from any one or several of these spools to be wound either singly or in multiple gangs at the bench lathe nearby.

The coil making lathe, made by Mr. Rowley, himself from a Chevrolet transmission, is operated by a variable speed

TREE TYPE RACKS keep stock of various sizes of magnet wire accessible in this isolated motor shop.

motor. The transmission provides additional range of speed above that available with the motor and makes it an easy matter to adapt the coil winding form to any particular speed desired. High speed for small coils or very slow speed for large ones are both available from this single unit.

RELAMINATED ROTOR—This giant 2000 pound rotor is in the shop of H. N. Crowder, Jr., Allentown, Pa., for a complete overhauling. It is part of a 400-kw., 25 cycle, 1450 rpm, 275-volt rotary converter supplying 250-volt direct current for operating mine machinery. Mechanic Moore is dressing it with new laminations and he says it will take 400 pounds of copper to rewind it.

TO ANY CONTRACTOR

BUSINESS is picking up, eh? That's good. All the big shots in the industry are predicting it.

Yes, we've got our warehouse chock full of every possible item you may need. Slow movers, as well as fast ones. $500 items, $50 items, 5¢ and 10¢ items. The works!

If there's anything we've overlooked, tip us off and we will have it for you in a jiffy.

The new catalogs, at our finger tips, will give you the latest price information you'll be asking for.

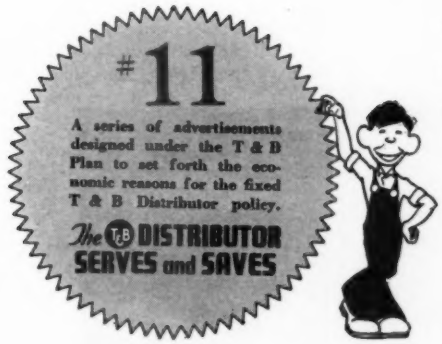
Out in front, our counter boys and order-fillers are ready for your messenger or 'phone calls.

Our delivery trucks are oiled and greased for quick deliveries.

We won't stop now to tell you how much capital we've tied up in these electrical supplies—to make them available to you. It's quite a hefty sum, we can assure you.

Of course, there's no law against your buying from non-service organizations, but considering our early and late, year 'round services, you probably won't by-pass us much anyway!

We thank The Thomas & Betts Co. for this opportunity of talking with you.


#11
A series of advertisements designed under the T & B Plan to set forth the economic reasons for the fixed T & B Distributor policy.
The T&B DISTRIBUTOR SERVES and SAVES

FROM ANY T&B DISTRIBUTOR

THE THOMAS AND BETTS CO., INC.

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N.J. • Sales and Service offices in 23 leading cities

T & B Distributors cover United States and Canada

Better Lighting

BURNING LAMPS OVERVOLTAGE

The present-day popularity of all outdoor recreational activities has created a tremendous demand on the part of the public to extend the facilities so that they might be enjoyed at night. Relatively few people can take the time during the day to play or attend games, but if proper illumination is provided these games may be thoroughly enjoyed at night.

In order that large recreational areas may be lighted sufficiently well to satisfy both players and spectators, it is necessary to plan the installation so as to get the maximum efficiency at a minimum cost. For lighting baseball, football, and soft ball fields and similar large areas, it is common practice to burn the lamps at 10 per cent overvoltage to help accomplish this purpose of efficiency and economy. By burning the lamps at 10 per cent overvoltage, the light output is increased about 35 per cent at an expenditure of only about 16 per cent in wattage, securing a very considerable addition to the light output without any additional equipment.

While the life of the lamps is materially reduced by overvoltage burning, the lamps will usually last for several seasons because, in general, they are used for such short periods during each season. The practice of overvoltage burning is economically sound for all sports lighting where the area is used only 100 or 200 hours each season and where cost of both equipment and installation is high.

FLUORESCENT WINDOW LIGHTING

The E. J. White Co., electrical contractors, Newark, N. J., recently designed and installed fluorescent lighting in the show windows of the Wholesale Radio Service Co., in that city. The installation was planned, not only to light the merchandise, but to attract the attention of passing pedestrians.

To accomplish this, sufficient lamps were installed in the window to light the sidewalk, 14 feet in width. There were two display areas, one 17 feet long, the other 11½ feet. Both were 6½ feet high and 4 feet deep. The large window shown in the picture is 13 feet long and contains two open reflector type fixtures, each having eight 30-watt daylight fluorescent lamps. The fixtures were mounted above the front window. The smaller window, 10 feet in length, contained one fixture with 12 30-watt daylight lamps.

Light meter readings taken on the sidewalk at given distances from the glass revealed the following average foot-candle intensities:

At the glass window.....	53 f.c.
At two feet.....	23 f.c.
At four feet.....20.4	f.c.
At six feet.....	10.6 f.c.
At 14 feet, the curb line....	3.3 f.c.

Intensities in front of the smaller window were somewhat less because of fewer lamps and the three windows.

***FOUNDRY LIGHTING**—Floyd Wells Foundry, Royersford, Pa., is probably one of the best lighted in the country. The installation consists of 400-watt Type H mercury lamps in Benjamin spread type dome reflectors. The units are spaced 16 feet apart and mounted 16 feet high. The 1.56 watts per square foot provides 25 foot-candles.*

RESTAURANT LIGHTING WITH FLUORESCENT LAMPS

While excellent food remains the basic element in the restaurant business, other factors are increasingly important in assuring customer satisfaction and profitable operation. Efficient service pleases the diner-out. Good furniture and air conditioning enhance physical comfort. But the psychological satisfactions of a pleasing environment are essential in a business which involves not only the merchandising of food and drink but the pleasures of relaxation and society as well.

Good lighting is a most important element in creating this desirable atmosphere for an interior. Genetti's at Hazelton, Pennsylvania, is an example

***ILLUMINATED SIDEWALK** attracts attention to this well lighted display window. The average intensity over the entire walk is 22 foot-candles.*

Yours For The Asking...

A Wealth of New Ideas and Fixtures That Will Mean

More Business For You

Day-Brite Lighting, Inc., 5429 Bulwer Ave., St. Louis, Mo.

U. S. RUBBER
Laytex*
BUI LD
AND BE
"DILEC" is Safecote plus. This smaller diameter, flame-retarding, moisture-resisting, slick finish wire has all of the qualities of Safecote, which wire has demonstrated its superior fishing qualities by test of many millions of feet in actual use.
MOISTURE RESISTING
SAFECOTE
SLICK FINISH

I LDING WIRE PUTS ON A NEW COAT

BECOMES Laytex* DILEC

As a licensee under "Dilec" service U. S. Rubber combines the small diameter features of Laytex insulation together with a new and novel fibrous covering, approved by the Underwriters' Laboratories. U. S. Rubber branded Laytex* "Dilec" wires and cables are the smallest in over-all diameter... and bring you a new opportunity to cash in on the national demand for increased branch-circuit capacities in present conduits.*

"These latex-insulated branch-circuit wires, with fibrous covering, and with 0.018-inch insulation wall, in sizes Nos. 10, 12 and 14 A.W.G., *are more than equivalent in insulation resistance, dielectric strength (volts-per-mil), durability of the insulation, current-carrying capacity, and facility of installation in rigid conduit, to similar sizes of standard rubber-covered wire made to conform to the requirements of the 1937 Edition of the National Electrical Code for Type R wire,* 'for voltages not exceeding 600 volts', and should therefore be entirely suitable for installation in accordance with the wiring methods set forth in Chapter 3 of the Code."

This is quoted from Electrical Testing Laboratories Report No. 150223.

See for yourself the superior construction of these new U. S. Rubber Laytex* "Dilec" wires and cables. You'll like the ease with which they slip in *and out* of conduits. Other U. S. Rubber building wires... U. S. Paracore... U. S. Relio... U. S. Eonite... now, too, are thinner, slicker, flame-retarding and moisture-resisting in their new jackets. Your distributor can quickly supply you from U. S. Rubber stocks all over the United States.

UNITED STATES RUBBER COMPANY · US · TRADE MARK ·

Laytex*

*Reg. U. S. Pat. Off.

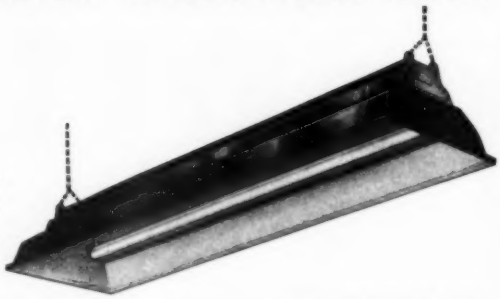
DILEC

UNITED STATES RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK, N. Y.

THE NEW WHEELER
RLM
FLUORESCENT LIGHTING UNIT

Every Wheeler RLM Fluorescent Unit bears the RLM Label which guarantees its authenticity and performance.



A TWIN LAMP UNIT (40 watts each) DESIGNED FOR GENERAL LIGHTING PURPOSES IN INDUSTRIAL AND COMMERCIAL AREAS

The Wheeler RLM Fluorescent Lighting Unit is designed and manufactured to conform with specifications established by the RLM Standards Institute for a type of Fluorescent Unit which will provide uniform general illumination and color correction in Industrial and Commercial areas.

The unit is recommended for use with the "Daylight" Fluorescent Lamp and can be used in any location where efficient daylight quality illumination is required. It provides color-corrected light, is extremely efficient, cooler in operation, ideal for color matching, easily installed, and easily serviced. The unit, which employs two 40-watt, 48" Fluorescent Lamps, can be supplied with Ballasts for 110–125 volt, 199–216 volt, or 220–250 volt operation. It is furnished complete with lamp sockets and starter switch sockets mounted in the ends of the unit in such a manner as to provide the desired lamp shielding angle of 17½ degrees below the horizontal.

Tulamp ballast equipment, with removable and renewable separate starter switches located in the sockets, and a compensator which facilitates starting and insures satisfactory lamp performance, complete the unit.

FEATURES

78% Light Output:

The reflector design, position and spacing of lamps, and high reflection factor of the porcelain enamel reflecting surfaces, combine to produce this high fixture efficiency.

72½ Degree Angle of Cut-off:

Lamps are positioned so that when a point from the center of a lamp is connected with a straight line to the lower edge on the opposite side of the reflector, this line will form an angle of 72½ degrees from the vertical.

Wattage Consumption:

The total wattage consumption of these two lamp fixtures, including lamp ballast equipment, runs between 94 and 98 watts, depending upon the circuit voltage.

Mounting and Spacing:

Intended primarily for low bay mounting, this unit will provide maximum efficiency at mounting heights up to 12′ above the floor.

The spacing between units should be approximately the same as the mounting height of the unit above the floor.

Finish:

Reflectors are porcelain enameled, gray outside, white inside.

Methods of Suspension:

Unit can be supplied for chain or pipe suspension.

For complete data write for New Bulletin No. 63

Distributed Exclusively Through Electrical Wholesalers

WHEELER REFLECTOR COMPANY

275 CONGRESS ST., BOSTON, MASS.

NEW YORK ATLANTA CLEVELAND

Better Lighting

[FROM PAGE 36]

FLUORESCENT LIGHTING — This restaurant uses fluorescent lamps to good advantage.

utilizing the fluorescent lamp. The details of the installation are as follows:

8 foot-candle general illumination at table top

Large cove
26—15-watt white fluorescent
22—30-watt daylight fluorescent

Two Coffers
32—15-watt daylight fluorescent

Alcove 7—30-watt white fluorescent

Cove over entrance
6—30-watt daylight fluorescent

Side Glass Windows
2—30-watt daylight fluorescent

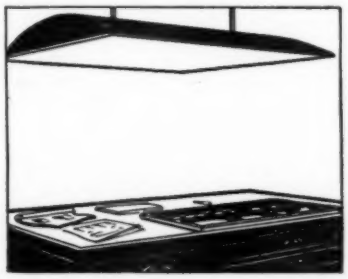
Main Window
7—30-watt daylight fluorescent

Fixtures, Curtis Strip—Alzak Reflectors

Cove is 44′ 6″ long x 13′ 6″ wide overall.

LARGE AREA SOURCES

Developed initially for lighting the type on imposing-stones, units of this type are particularly applicable for those operations involving detail upon polished surfaces, such as scribing. If the



source is uniformly bright, the detail on the specular surface will not be obscured in a confusing background, such as frequently results when small sources or a source of varying brightness is employed.

UMI

• • ANNOUNCING THE NEW WESTINGHOUSE • •

ServisFlood

Completely Adjustable SERVICE STATION FLOODLIGHT

OFFERS EXCLUSIVE "TAILORED LIGHTING"

The new Westinghouse ServisFlood—completely and easily adjusted "on-the-spot"—puts light where it is needed to obtain maximum sales effectiveness and provides "two floodlights in one." A strong, over-all beam lights the general station property and a "spotlight" beam highlights station buildings, or important service points.

ServisFlood fits the over-all light distribution to individual service station areas for exact coverage . . . regardless of varying distances from the floodlights to the specific area or building being lighted. Two hand-operated adjustment screws on the floodlight bracket headpiece place the "spotlight" beam pattern exactly where it is wanted and, also, narrow or expand the beam.

ServisFlood is available in 300-500 watt units for both bipost and screw-base lamps, in 750-1000 watt size for bipost lamps only, and for 400-watt short arc mercury lamp.

In specifying or recommending lighting for new stations or modernization, be sure to have complete information on the new Westinghouse ServisFlood. Simply detach and fill in the coupon below. Westinghouse Electric & Manufacturing Company, Lighting Division, Edgewater Park, Cleveland, Ohio.

WRITE TODAY!

Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, O.
Please send me, without obligation, engineering data and prices on your new ServisFlood.

Name_____
Street_____
City_____
State_____

Tune in "Musical Americana", N. B. C. Blue Network, every Thursday evening.

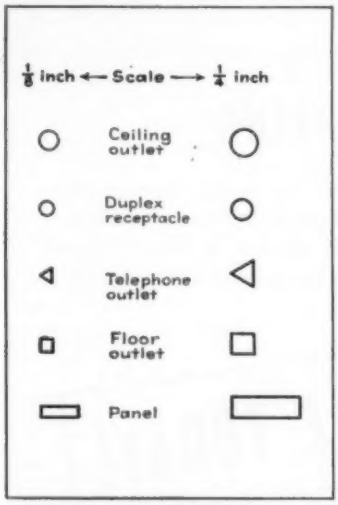
Westinghouse Lighting Equipment

Estimating

SYMBOL TEMPLATE

To save time in making layouts for new and redesigned electrical systems, J. W. Kenney, electrical engineer and estimator for James Wilkinson & Co., Boston contractors, has made a celluloid template with scale cut-outs of the common electrical symbols used most frequently.

The template, made of stiff celluloid, measures about two inches wide and



***SYMBOL TEMPLATE** of celluloid with scaled cut-outs facilitates plan drawing for electrical systems.*

three inches long. The symbols are arranged in two vertical rows, one being cut out to the ¼-inch scale, the other to the ½-inch scale. When cutting out the symbols, enough allowance was made so that the resultant marking, made with a sharply pointed pencil, would be as close to scale as possible.

The symbols on the template include a circle for the ceiling outlet, a smaller circle for the receptacle, a triangle for the telephone outlet, a square for the floor outlet and a rectangle for the panel. Of course, the cut-outs in the ½-inch column are twice the size of those in the ¼-inch column. The panel symbol is cut out to scale to represent a panel 20-inches wide, 4½-inches deep.

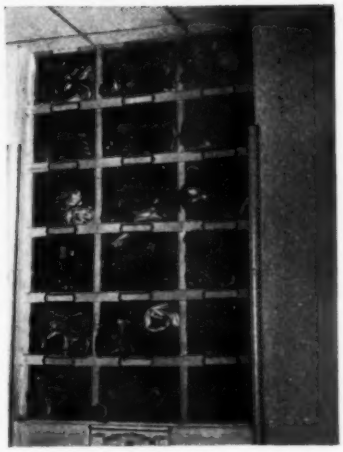
Plan drawing is made easier by the use of this template since it takes less time to run a pencil around the inside of the symbol cut-out than to use a bow compass or triangles and it eliminates the necessity of using a scale to draw in panel symbols. It is especially helpful where panels, boxes and outlets are located in restricted spaces.

HANDY BLUE PRINT RACK

Weiderman Electric Co., Inc., efficiently uses any waste space in its Brooklyn, N. Y., office. A former unused three foot passage between two of its offices is now a compact recessed blue print depository.

The upper half of the old passageway is used to hold prints for one office. The lower half serves the same purpose for the other office. The section shown is 29-inches wide, 42-inches high and approximately 36-inches deep, and contains 18 "pigeon holes", each approximately 9-inches by 6-inches in size. Each one contains prints of installations made for Mr. Weiderman's customers. So when estimating additional work Mr. Weiderman has a complete plan of the entire electrical system for reference. The customer can be assured of proper recommendations and an adequate electrical layout at all times.

***GLASS TOP** tracing table illuminated from the bottom by incandescent or fluorescent lamps speeds the task of making working drawings. Eye strain is reduced since the light comes through the frosted glass top from underneath instead of above the blue print. This table is used constantly in the office of James Wilkinson & Co., Boston, Mass.*



***RECESSED RACKS** for depositing blue prints are constructed in an unused passageway between two offices.*

COMPARATIVE WIRE PRICES

The Adequate Wiring Club of Kansas City, Missouri, prepared a study on March 26, 1940 of the comparative prices per thousand feet of wire for sizes from 2 to 14 in various types of insulation.

The prices shown are those of representaitve manufacturers and are contractors costs for Kansas City as of the date mentioned. However, the relation between the cost of conductors of different types of insulations are considered by the organization to be of significant importance to contractors who are preparing preliminary layouts and estimates in the promotion of rewiring work. R, RP, RH, are conventional diameter wires. RHP, Latex, SM are small diameter wires.

Comparative prices of insulated building wire of six new insulation designations.

SIZE		TYPES OF INSULATION					
		R	RP	RH	RHT	LA-TEX	SN
	14	$5.40	$8.20	$9.80	$9.70	$12.00	$20.70
	12	7.30	11.20	13.30	13.20	16.00	24.60
Solid	10	10.80	15.30	18.10	17.90	22.00	30.00
Stranded	10	12.40	17.70	20.90	20.70	26.00	
Solid	8	17.70	25.10	29.50	29.20		44.50
Stranded	8	19.20	27.10	31.80	31.50		50.40
Stranded	6	28.30	37.80	43.50			75.20
	4	37.40	49.50	56.90			94.70
	2	54.60	67.20	77.30			122.00

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EVERY OUTLET DESERVES

A **BRYANT** DEVICE

Fluorescent STARTERS

Bryant Fluorescent Lamp Starters simplify the maintenance of fluorescent lamp installations. The compact aluminum cylinder encases a glow switch, which starts the lamp automatically, and a condenser for elimination of radio interference. The starter is inserted or removed with a simple twist of the wrist. Consult the Bryant catalog which lists devices for every fluorescent need. Standardize on Bryant and be sure of high quality and superior performance.

BRYANT

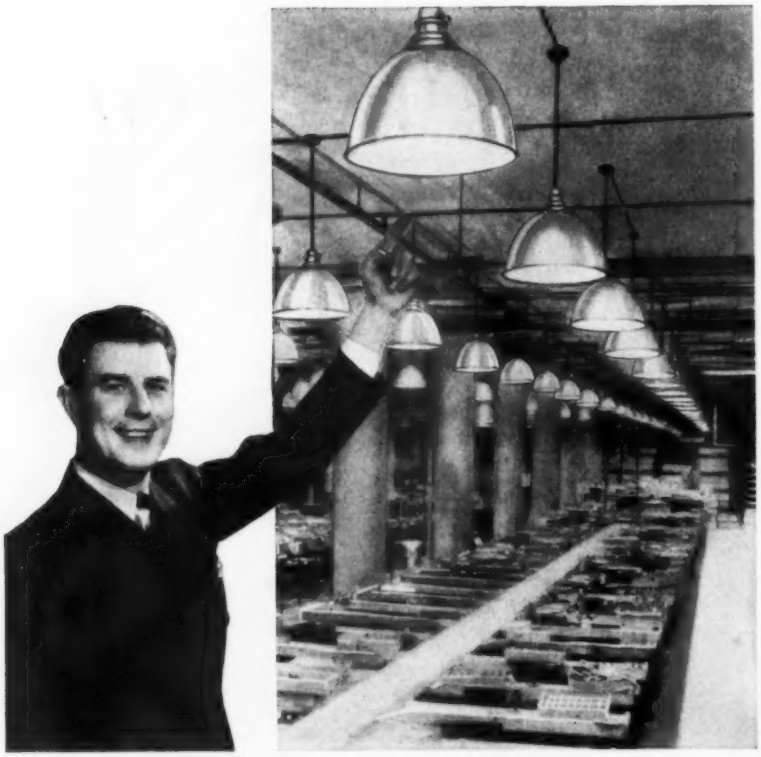
SUPERIOR WIRING DEVICES

The Bryant Electric Company
Bridgeport, Connecticut

ADEQUATE WIRING SERVES AND SAVES

SOLD THROUGH ELECTRICAL WHOLESALERS NATIONALLY

THERE IS A **BRYANT** DEVICE FOR EVERY WIRING NEED



SEE HOW THE LIGHT SOURCE IS SHIELDED? *IT PREVENTS GLARE*

Now, you can banish harsh glare that tires the eyes and slows the hands —and still have the bright, general illumination desired for many industrial tasks. This completely new reflector, deep-skirted to shield the light source from the field of vision, uses a diffusing globe of exceptionally high transmission value. It gives you maximum lumen output—yet there is no glare, because the light is more accurately controlled.

GOODRICH "PROTECTO" DIFFUSER

In contrast with other combination reflector and globe fixtures, the "Protecto" globe does not protrude below the skirt of the reflector. Glare is effectively eliminated. General illumination is also improved because a portion of the light is directed through apertures at the top of the reflector to illuminate the ceiling. The "Protecto" Diffuser is another Goodrich development in lighting. Write for catalog sheets to secure complete information.

Sold only through electrical wholesalers

MEMBER OF R. L. M. STANDARDS INSTITUTE

GOODRICH ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2902 N. OAKLEY AVENUE, CHICAGO, ILL.

Estimating

[FROM PAGE 40]

PRIVATE DWELLING

A fifteen-room single family, two story, frame house recently built in Yonkers, N. Y., was wired for a total of 124 outlets. The entire electrical installation was made with armored cable. Labor data, including the hanging of all fixtures, was carefully recorded by the contractor for his future use.

The material installed included the following:

SERVICE EQUIPMENT

2—No. 6 r.c. and 1—No. 8 bare conductors in 1-in. conduit
1—60 ampere, 110-220-volt socket type meter pan
1—10 circuit main distribution panel with a 60 ampere main switch
25—Single pole tumbler switches
10—3-way tumbler switches
2—4-way tumbler switches
32—Ceiling outlets
43—Duplex receptacles
1680 feet—2 wire No. 14 armored cable
460 feet—3 wire No. 14 armored cable
1—Front and rear door chime
1—Dining room floor push button
1—Servants' call buzzer

The labor distribution was as follows:

SERVICE—included mounting service conduit, meter board, meter equipment, distribution panel; pulling in feeders and making connections.
Total time ..... 9 m. h.

ROUGH WORK—included setting all boxes, lacing and fastening of cable.
Total time ..... 40 m. h.

BELL WIRING—included installation of all wire for chimes, buzzers and push button stations.
Total time ..... 4 m. h.

SPLICING—included splicing for all outlets throughout the entire house. This was done before the rooms were lathed and plastered.
Total time ..... 6 m. h.

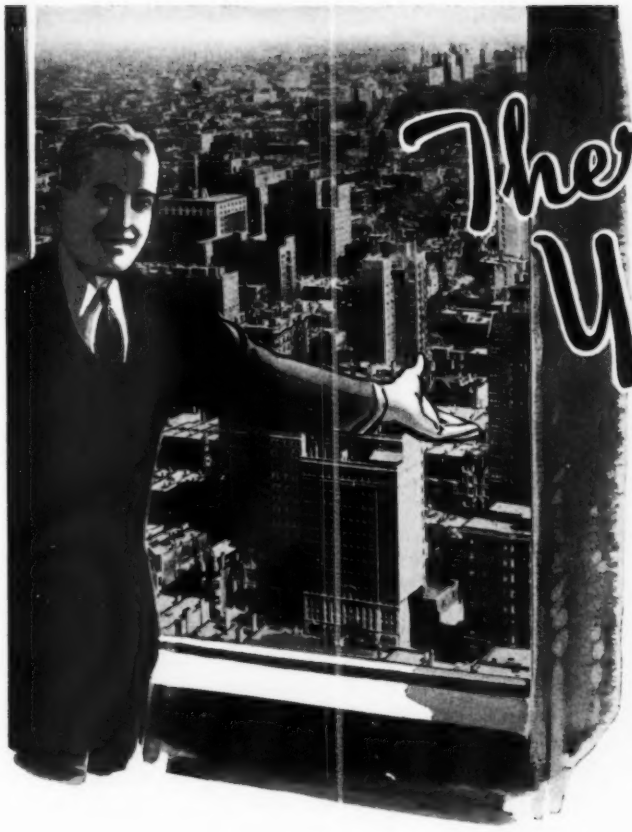
FINISHING WORK—included mounting all switches and receptacles and testing bell wiring.
Total time ..... 7 m. h.

HANGING FIXTURES—included hanging 32 fixtures.
Total time ..... 7 m. h.
Average time per fixture.. .219 m. h.

BELL WORK—included hanging chimes, bells and buzzers.
Total time ..... 2 m. h.
Total time for entire installation.. 75 m. h.

The above figures do not include non-productive or supervisory labor.

Data from Lawrence Electric Co., Yonkers, N. Y.



There's Your Market for Automatic Electric Private Telephone Systems

If you have a good view of the whole town from your office you have a view also of your market for Automatic Electric private telephone systems.

Nearby, in the business district, are offices and stores. Beyond are shops, factories, schools and homes. All are prospects for time-saving, money-saving interior telephones. Go after this market with the Automatic Electric line—there's money in it!

Automatic Electric, originators of the automatic telephone and manufacturers of both public and private systems for over fifty years, make a type to fit every need.

If you are not now selling Automatic Electric private telephones begin at once. Your local electrical wholesaler will supply you with literature and prices. Talk to him!

These intercommunicating systems are designed for private service. They are not intended to be connected with the public telephone system.

AUTOMATIC ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois

Sales and Service Offices in Principal Cities • In Canada: Canadian Telephones & Supplies, Limited, Toronto

Questions ON THE Code

Answered by

F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

What—No Junction Boxes?

Q. *"The local inspector says we should not use junction boxes because the rules say that you should run from outlet to outlet. For instance; when wiring the second floor of an old house with BX to get away from having so much wire in a ceiling fixture I have been running my wires to a four inch square box in the attic using this four inch square box as a junction box instead of running all my wires to the ceiling fixture. I have been using a four inch square box whenever it was easier to get away from having so many wires in my ceiling fixture that it is difficult to get the canopy up.*

"Would this be breaking the rule of running only from outlet to outlet? I have been making these junction boxes accessible of course. Can the contractor use a junction box whenever he pleases or can the inspector say how many junction boxes can be used?"—E.N.

A. Section 3034 requires that "conductors shall be continuous from outlet to outlet" which certainly seems to preclude the use of junction boxes as described above.

However, such is not the intent of the Code. In Sections 3038 and 3171 we see that raceways and all cable assemblies "shall be continuous from outlet to outlet *and from fitting to fitting.* It has always been the practice to permit the use of junction boxes provided they meet with the various provisions of the Code as to their accessibility and space provided for the enclosed splices.

Section 3713 requires that junction boxes be accessible and Section 3705 requires that there shall be a space of at least 2 cubic inches for each No. 14 wire in the box. If these two provisions are complied with there should be no objection to the use of the junction boxes. But they must not be concealed under the attic flooring but must be left accessible.

If four inch square boxes are used as outlet boxes at the fixture outlets it seems as though there should be sufficient room in them for all of the wires and splices required in the average sized house and therefore the need for the separate junction boxes would be eliminated.

Service Drop

Q. *"Have we made the right decision on Article 230 Section 2303?*

"There are two houses on the same lot, with owner living in the front and renting the house in the rear. He ran a rigid conduit service (concealed) from the front of his house to serve the house he rented in the rear. They wanted us to connect our service drop to both of the services on the front house. We would not connect the service for the one in the rear until a fuse was installed at the weatherhead."—L.T.

A. If the service to the rear house passes through the front house the service wires should be fused as was required in this instance. But if, however, the service to the rear house was installed on the outside of the front house so as not to be concealed or was run underground or under at least two inches of concrete, then the two sets of service conductors could be tapped from the same service drop without having to fuse either one until they enter the house which each serves.

These points are covered in the Code in Section 2302, Paragraph B and Section 2303.

***ADEQUATE WIRING** club president, Art Smiley of A. E. Smiley & Co. electrical contractors, heads up an active group of contractors devoted to improving standards of wiring adequacy in Kansas City jobs. Mr. Smiley took an active part in laying out and promoting some of the first small diameter wiring jobs in the Midwest.*

Join the IAEI

Q. *"Would you, if possible, tell me where I could get all possible information of the National Electric Code? By this I mean, know where I can obtain information on various subjects on the Code (in advance to their addition), also what is the procedure of becoming a member of the IAEI.*

"My intentions are to make a systematic study of the Code as to its use, the procedure of making and revising. I have studied all of Abbott's handbooks on the Code and others of similar nature and yet feel that there are subjects that I have not had practical experience with. In short, I would like to become an expert at electrical wiring and with the N.E.C. I am willing to pay any fees connected with any associations or schools.

"My experience has been limited to house wiring, mills, garages, and also some motor work. I am at present steadily employed with the Erie R. R. I am 30 years of age."—R.L.M.

A. Our subscriber has given us a rather large order. However, with a background of the knowledge which he has already acquired, the rest of the education which he desires should not be so difficult, especially with the aid of his unconquerable ambition.

The first step in that direction to be taken is to become a member of the International Association of Electrical Inspectors. He is eligible to become an Associate Member in that organization. The annual dues are $4.00.

Members of the IAEI receive bimonthly the IAEI News-Bulletin which is replete with news of the industry, timely articles on many important electrical subjects, official interpretations of the National Electrical Code and many, many other informative subjects.

UMI

Members also receive copies of each new edition of the Code as each issue is published and are kept in touch with proposed Code changes and receive copies of the Article Committee Reports of the Electrical Committee. Also, the List of Inspected Electrical Equipment of Underwriters' Laboratories is furnished to each member as well as much other literature of electrical matters.

Membership in the IAEI not only aids and encourages the Electrical Inspectors but also keeps the Associate as well as the Active Members alert to the rapid advances being made in all branches of the industry.

Capacity of No. 14 Wire

Q. *"I would like to know how many watts a 110 volt circuit fused at 15 amperes No. 14 rubber covered wire will safely carry."—L.L.*

A. The safe carrying capacity of a No. 14 wire and also the maximum permissible load on a 15 ampere branch lighting circuit is 15 amperes. 15 amperes multiplied by 110 volts = 1650 watts, which is the answer.

Test Old Wiring

Q. *"In buildings that have been inspected and have later had some rooms destroyed by fire, causing the lath and plaster to have to be renewed and of course some of the wiring, what is the proper and safe thing to do in regards to the Code and the requirements?"—G.C.P.*

A. First, of course, the local inspection bureau having jurisdiction should be consulted.

All of the old wiring should then be tested and thoroughly and carefully examined to determine which of it has been damaged and should therefore be discarded. The wires should be tested for insulation resistance and also for mechanical and physical defects.

A rubber covered wire on which the insulation has so dried out as to render it unfit for further service, may have as high a resistance as a piece of new wire as long as it is kept dry but when subjected to moisture will show a very low resistance. Such wire should be discarded. Any wire, cable, or other equipment which has been subjected to excessive heat or to fire, should also be thrown aside.

Any fire which has been intense enough to damage lath and plaster will also damage any electrical equipment within the walls and generally for quite some distance from the burned area.

G.E. Offers a Sales Building Flexible-cord Rack

"Gentlemen, It's Mighty Handsome"

"It'll Attract Customers"

"Sure Help to Increase Sales"

This new G-E Cord Rack will help to sell more cord than you've ever thought possible. With it you can display ten different spools of cords in a prominent location in your shop or store. Your customers will be attracted to it. They'll be reminded of the cords they need. You will sell cord more easily.

The rack is 31 inches high and 28 inches wide. It is sturdily constructed. The cords recommended for display on the rack include:

2—250-foot spools of GE #18 1/32 Type C Glazed Cotton Cord (1 Olive and 1 Green and Yellow)
2—250-foot spools of GE #18 1/64 Type PO Rayon Cord (1 Brown and 1 Old Gold)
1—250-foot spool of GE #18-2 Type SV, All-rubber Cleaner Cord
1—250-foot spool of GE #18 PO-SJ All-rubber Cord (Ivory)
3—250-foot spools of GE #18 PO-SJ "Special" All-rubber Cord (1 Ivory, 1 Brown and 1 Olive)
1—250-foot spool of GE #18-2 CordX, Jr. (GE SJ) All-rubber Cord

Of course the G-E line includes many other cords. Therefore, if the cords popular in your community are not listed above you can substitute them for some of the recommended cords. Ask the G-E Merchandise Distributor in your territory how to obtain this rack. Decide with him which cords you will display. Or mail the coupon below.

G-E Building Wire 600-volt Maximum

1. Use G-E rubber-insulated building wire for new wiring. It is easy stripping, clean stripping and easy pulling. Available in four grades: Code, Performance, Heat Resistant Moisture Resistant.

2. Use Flamenol *small diameter* building wire for rewiring existing raceways. Its synthetic compound insulation is superaging, has high dielectric and mechanical strength, retards flame, resists oil, etc.

Available in sizes #14 to #4/0.

General Electric Company
Section W-0125
Appliance and Merchandise Department
Bridgeport, Conn.

Sirs: Please send me information on

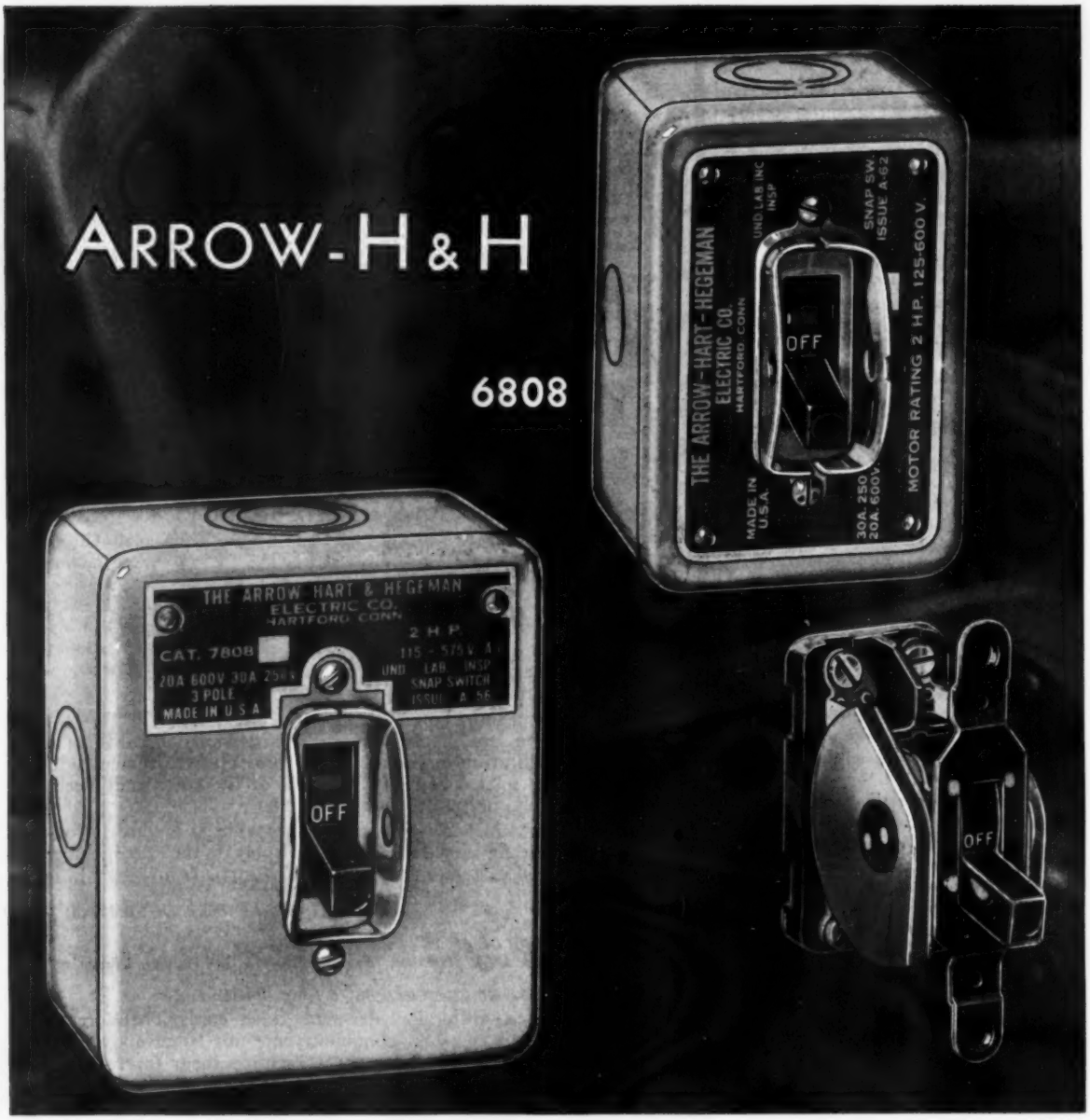
( ) G-E Cord Rack
( ) G-E Rubber-insulated Building Wire
( ) Flamenol Building Wire

Name.....

Address.....

City.....State.....

GENERAL ELECTRIC



Small Motor Starting Switches

ACROSS-THE-LINE TYPE **Tumbler Switches, without overload protection. . . Give positive control for motors; especially suitable for oil burners, refrigerators, motor-driven machinery and lighting loads.**

These switches have rugged, durable mechanisms built to perform with the sturdy integrity characteristic of Arrow-H & H Lines. Bakelite arc snuffers increase breaking capacity; kick-off release mechanically starts the switch blades in motion and prevents sticking; extra-heavy blades and contact jaws increase current-carrying capacity.

Different styles of mounting are supplied for a wide range of machine-design requirements. Separate switch units are available for installations in switch housings built into motor-driven machinery.

No. 6808 (upper right) is a double-pole switch for single phase motors; No. 7808 (lower left) is 3-pole for 3-phase jobs. Also, the line includes 3-way, 4-pole and 2-speed reversing switches. All have horsepower ratings . . . Everything you may need in this line will be found in Motor Starting Switch Catalog No. 8-M — on request.

INDUSTRIAL CONTROL DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

UMI

ELECTRICAL

Maintenance

INDUSTRIAL AND COMMERCIAL

MAN-MADE WEATHER

AS industry progresses it is becoming more conscious of the imperative necessity of improving the atmospheric conditions within the manufacturing plant. It has learned that both the quantity and quality of the products can be increased if proper working conditions are available for the process and for the employee. Also numerous products are available today, solely because rigid control of temperature and humidity are possible during the processing stage.

Conditioned atmosphere, or "man-made weather" for both industrial and commercial buildings is obtained by the use of various types of ventilating and air conditioning equipment. Each building has its own specific problem and the apparatus chosen must fit the requirements of that particular system.

But, once the installation is made, the all important problem of keeping it in perfect operating condition arises. This responsibility usually falls into the lap of the maintenance man. He must know how to keep the system operating continuously and efficiently.

To aid the maintenance man in his "weather man" duties, the Maintenance Guide Sheets, this month, present a general review of the application and maintenance of ventilating and air-conditioning equipment. Previous articles covered:

1. Alternating Current Motors
2. Direct Current Motors
3. Alternating Current Motors — Maintenance
4. Direct Current Motors — Maintenance
5. A.C. Motor Starters and Controllers
6. D.C. Motor Starters and Controllers
7. Maintenance of Control Equipment
8. Special Control Problems
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices
19. Circuit Breakers
20. Equipment for Hazardous Locations
21. Transformers
22. Wiring Devices and Fittings
23. Wire and Cable
24. Belts and Pulleys
25. Couplings, Gears and Chains
26. Elevators, and Industrial Trucks
27. Conveyors, Cranes and Hoists
28. Ventilating and Air Conditioning Equipment (this issue)

Next month's article will discuss

29. Management of Maintenance

VENTILATION and AIR CONDITIONING

Equipment and Maintenance

FRESH air whether in natural or conditioned state is necessary to meet comfort and process requirements. The electrical maintenance man must be familiar with the equipment involved to supply the air. Therefore, this discussion presents a quick review of movement and conditioning of air, with respect to the equipment and how to keep it in operating condition.

Ventilation

Ventilation is the voluntary act of changing the motion, heat content, moisture content, dirt and odor content of air in order to attain any desired result upon people or materials in a given space, by exhausting polluted air and replacing with fresh or clean air.

Satisfactory results are rarely obtained by natural ventilation which depends on the wind, temperature changes, open doors, windows and skylights. As a result, it is customary to employ some type of mechanical power-driven air pump. The mechanical equipment is divided into two basic design types: (1) disk or propeller type fan and (2) centrifugal or blower type fan.

Disk or propeller type fan is designed to move a maximum volume of air against no restriction, or resistance to the free flow of air to and from the fan, at a minimum power consumption.

Where a fan is installed to exhaust to the outside, a shutter with a hood should be provided for protection from wind, rain and ice. An automatic shutter eliminates the possibility of neglecting to open the shutter when the fan is started.

As the fan will draw the air from the nearest source of supply, it should be installed at a point opposite the supply, to insure the air being moved across the area to be ventilated and prevent dead air pockets.

Where quiet operation is desired, a larger unit at slow speed should be selected and installed in a panel which has been treated with sound absorbing material.

Air flowing through the fan will carry dust, grease, moisture, etc.; therefore, it is important that the motor be protected with a ventilated hood.

If the air being exhausted is charged

A PLEASANT ATMOSPHERE aided by an exhaust fan is conducive to sales (Ilg Electric Ventilating Co. photo)

FOR A LOCAL OPERATION — *Fan (lower left) cools engraving plates and another (upper right) exhausts fumes from the smelting pot. (American Blower Corp. photo)*

with acid fumes or moisture, the wheel should be made of some resisting material or treated with a resisting covering. The wheel should be inspected regularly, also be kept clean in order to maintain its proper balance and alignment. These may be destroyed by accumulations of dirt and cause excessive wear of the bearings.

Guards should be placed on the fans within reach: for unguarded fans when in motion are hazardous.

Before oiling or any inspection or service work is attempted, the fan should be shut down. The installation should include a safety switch near the fan, to disconnect the motor when servicing the unit and prevent starting while work is being done.

Centrifugal or blower type fan is used where the blower can be installed in some convenient location, remote from the area from which the air is to be exhausted or supplied, and connected to the area by a system of ducts. This unit will develop a total pressure which is divided into static pressure and velocity pressure.

Capacity of the unit on a system can be increased or decreased by a change in speed. Pressure will vary as the square of the ratio of change in speed. Power demand will change as the cube of the ratio. Volume or cubic feet per minute displaced will vary directly as the speed.

Volume of air required is usually expressed as number of air changes per minute, from which the total cubic feet of air to be moved by the fan or blower is determined. One air change is the replacement of the total volume of air in a given space.

Where two or more separate areas are to be ventilated by the same blower through a system of ducts, the requirements in each area are added to arrive at necessary blower capacity.

Where large volumes of air are to be removed or supplied, the total volumes should be divided into a number of smaller volumes. The points of introduction or exhaust for these smaller volumes should be located at various points in the space to be ventilated so as to accomplish better distribution. The rate of flow of the air at these points may be between 300 and 500 feet per minute, depending on the proximity of persons or processes where drafts would be objectionable.

Location of the blower is selected depending on available space, economy of duct work on both sides, objection to operating noise, and accessibility for maintenance of power unit and controls.

Motors for the blower are squirrel-cage or shunt-wound d.c. type for constant speed; multispeed squirrel-cage, slip-ring, or adjustable-speed d.c. for a range of operating speeds; and are either belted or direct connected.

Duct sizes are governed by the volume and velocity of air, and may be round or rectangular in shape. Metal ducts are preferred because smooth surfaces can be obtained and excessive resistance to air flow is avoided.

Construction and installation of all metal ducts should be rigid and maintained in that condition so as to eliminate vibration. The slip joints should be in the direction of the air flow.

Near the inlet of each blower or exhauster, the duct should be provided with a door so that an inspection can be made, and fan wheel and housing can be cleaned. Doors at various locations in the duct system are necessary for cleaning the ducts.

Where fresh air is supplied particularly from outside, air filters are installed for removing dust and soot, heating coils are used to temper the incoming air, and air washers for cleaning and, in some cases, cooling or adding humidity to the air.

Air Conditioning

Air conditioning involves the simultaneous control of temperature, humidity, air purity, and air movement within a structure.

In summer the principal functions are cooling, dehumidifying, cleaning and circulating the air.

In winter the principal functions are heating, humidifying, cleaning and circulating the air.

Year-round air conditioning includes cooling and dehumidifying the air in summer, heating and humidifying the air in winter, and cleaning and circulating the air at all seasons.

The purpose of air conditioning is to improve the quality of the product; to reduce manufacturing costs; to protect equipment, products in process, and raw and finished products in storage; and to improve employee health and efficiency.

Each air conditioning job is an individual study, depending on its purpose, occupancy, local climate, variance from outside conditions, closeness of control, amount of productive equipment which gives off heat, sun effect, kind of structure, local customs, and investment and operating cost required to maintain specific conditions.

For comfort cooling, the difference between indoor and outdoor dry bulb temperatures should not exceed 10 deg. F. *Effective* indoor temperatures between 71 and 74 deg. F. are produced when the dry bulb temperature (indoors) is 76 to 80 deg. F., relative humidity is 45 to 55 per cent, and air flow is approximately 20 ft. per min.

Winter heating is usually designed to maintain an indoor temperature of 70 deg. F., when the outdoor conditions are assumed to be 10 deg. higher than the lowest recorded temperature for the respective locality. About 50 per cent relative humidity is considered standard.

The amount of humidity is determined for the condition, i.e., process or comfort, or both. Inside dew-point temperature must be lower than inside window surface temperature otherwise the single type window will be "steamed" or fogged. Where high humidity is required, double-window or windowless construction is necessary, or drainage of condensation from the window must be provided.

The various factors in air conditioning require the following equipments;

AIR CIRCULATION *for a relatively large area is provided by a portable pedestal type fan.*

MAINTENANCE GUIDE CHART

VENTILATION

Recommended Air Changes

For	Every
BAKERIES	3 min.
BANKS	5–10 min.
BASEMENTS	5–10 min.
CHURCHES	5–10 min.
FACTORIES	5–10 min.
GARAGES	5–10 min.
HALLS	5 min.
KITCHENS, RESTAURANT, HOTEL and RESIDENCE	2 min.
LAUNDRIES	2– 5 min.
LOCKER ROOMS	5 min.
OFFICES	5–10 min.
RETAIL STORES	5–10 min.
THEATERS	2– 5 min.
TOILETS	5 min.
VAULTS	5–10 min.
WORK ROOMS	5–10 min.

Suggested Air Velocities

SYSTEM	Ducts or Openings	Velocity, ft. per min.
SUPPLY	Main	1,000–1,500
	Branch	500– 800
	Register	350– 500
EXHAUST	Main	1,000–1,500
	Branch	800–1,200
	Register	400– 800

Determining Duct Sizes and Velocities

Area = CFM ÷ Velocity; CFM = Velocity ÷ Area; Velocity = CFM ÷ Area where Area of duct in square feet = length times width, in feet; CFM = cubic feet of air per minute; Velocity = air speed in feet per minute.

Pressure loss in inches of water, due to friction of air, per 100 ft. of duct, and to elbows or bends, can be determined from tables in literature of fan manufacturers.

AIR CONDITIONING — Conditions Maintained in Some Industries

Application	Purpose	Dry Bulb Temp. Deg. F.	Relative Humidity, Per Cent
BAKERY			
Flour Storage	Hold moisture content of flour at desired point to prevent molding	80	60
Dough Room	Use standard mix independent of outside weather conditions	80	25–80
Proof Box	Produce a uniform product with equivalent amount of " proofing "	90–95	90–95
CONFECTIONERY			
Starch Rooms	Prevent lumping and caking of starch	25 or 80	50 or 60
Packing and Storage Rooms	Maintain full quality of products	65	Room Dew Point 46 or lower
CEREALS			
Manufacturing	Avoid shut-downs due to high humidities	80 75	50–45 (summer) 40 (winter)
EGG			
Storage, Long	Maintain uniform temperature	29–31	85–90
FUR			
Storage	Protection against fur and fabric pests	38–42	55–70
MEAT PACKING			
Cutting Floors, Pork	Eliminate formation of condensate on cold surfaces	55–60	35–40
Curing	Maintain constant temperature for uniform curing	38	80–85
Smoking	Assure a lasting " bloom "	170–110	50–75
Hide Storage	Prevent condensation and drippage	50–55	80–90
Dried Beef Storage	Minimize danger of molding	55–60	80–90
PRINTING	Conditions required based on " comfort zones "	75–80	50–60
PHARMACEUTICALS			
Granulations, Powder Pills, and Tablets	Prevent lumping, caking and sticking of materials. Air conditions to be maintained dependent on drug handled	80–165	30–50
RUBBER			
Crude, Drying	Increase tensile strength	120–170	35
Dipping Room	Assure uniform thickness of walls	90–95	70–80
Cementing Room	Eliminate imperfect joints caused by condensation	80	42–45
SHOES			
Wet Stock Dryer	Insure uniform dryness	130	30
Mulling Room	Obtain uniform lasting	85–90	85
Loft Dryer	Assure uniform drying	130	25
SUGAR			
Storage	Eliminate caking, lumping and stickiness	80	35–40
TOBACCO, CIGARS			
Aging	Reduce aging time; prevent discoloration, rotting and breakage of leaves	90–100	65–70
Storage	Maintain constant conditions for constant adjustment on cigar making machines	76	70
Packing and Storage	Maintain quality; allay effect of microscopic insects; permit steady rate of production	76 (packing) 40 (storage)	60–55 (packing) 40 (storage)

AIR CONDITIONING *provides comfortable working conditions for these employees on denture production. (Carrier Corp. photo)*

in some cases two or three factors are handled by one equipment.

Cleaning—removing impurities from air: filters, dry or viscous, cleanable or renewable types; electrostatic precipitators; washers; sprays.

Temperature — adding or removing heat: heating coils; cooling coils; sprays; washers.

Humidity—adding or removing moisture: spray air washers; atomizers, humidifiers; combination spray-coil dehumidifiers; silica-gel dehumidifiers.

Ventilation—supplying proper amount of air: fans; dampers; diffusers.

Air motion—distributing air: dampers; diffusers; fans.

Controls—manual, semi-automatic, automatic: thermostats; humidistats; psychrostats; pressurestats; thermocouples with electronic devices; solenoid valves.

Other equipment includes pumps, piping, ducts, gages, refrigerating machines.

Air conditioning systems may be divided into two general classes: central systems and unit air conditioners. Central systems consists of assemblies of air conditioning apparatus with ducts to supply conditioned air to one or more zones. Provision is usually made to recirculate all or part of the air from the conditioned zones, to reduce cost of operation.

Unit air conditioners are a factory assembly of equipment within one case. The units containing a refrigerating system are known as self-contained units. Self-contained room conditioners are usually portable types, arranged for connections only to electric power outlet and to the outside through a window. Units of the water-cooled type, or equipped with heating coils and humidifiers for winter service, require plumbing connections.

Self-contained room conditioners range in capacity (total heat removal) approximately from 3,000 to 9,000 B.t.u. per hr., and are equipped with $\frac{1}{2}$ to $\frac{3}{4}$-hp. single-phase motors.

Self-contained commercial units with built-in refrigerating systems range in capacities (total heat removal) from 2 to 15 tons. One ton of refrigeration is equivalent to heat removal at the rate of 288,000 B.t.u. per 24 hours.

Removing heat from air is one of the biggest jobs in air conditioning. Cooling can be obtained economically by using well water, blowing air over ice, or melting ice and circulating the chilled water.

Refrigerating systems employing the mechanical compression method are in general use. Centrifugal, reciprocating and rotary compressors are usually driven by constant-speed motors, either squirrel-cage or synchronous types.

Maintenance

Maintenance of motors and control for fans and blowers includes monthly inspection, lubrication, servicing, etc. as required for similar equipment on other machines in the plant.

On other parts of the ventilating system, maintenance consists largely of keeping the various accessories in operating condition. Filters, washers, heating coils, etc., should be cleaned and inspected at regular intervals. Where greasy, moist or dust laden air is being handled, the blower should be inspected for accumulations in the bottom of the housing, or on the blades where it will cause the wheel to become unbalanced. The presence of a quantity of these obstructions to the free flow of air through the blower wheel and housing or other parts may seriously reduce the capacity and efficiency of the system.

Maintenance of the air handling circuit of an air conditioning system is somewhat similar to that of a ventilating system. This circuit includes equipment such as blowers, fans, dampers, ducts, filters, heating and cooling coils, washers, motors and control.

The refrigerant circuit includes compressors, condensers, evaporators, pumps, valves, piping, motors and control. For this equipment a definite maintenance routine is as essential as for any other apparatus or device.

Compressors, coils, and refrigerant piping should be checked periodically for leaks.

Oil pressures and pressurestat settings should be checked on forced-feed lubrication of compressors. Condensing water should be analyzed at least once a year and should have a pH value of from 7.5 to 8.5 to keep scale formation at a minimum.

All electrical equipment of an air conditioning system requires inspection and servicing at least once a month. Motor bearings, brushes, air gaps, and commutators must be checked, as well as line voltage and insulation resistance. Starter contact tips and fingers require adjustment. Electrical connections must be kept tight.

For the controls, color coded wire should be used for ease of identification at the terminals and for splicing. Only low-voltage circuits may be used in the same conduit. Proper insulation is necessary when wires are used in damp places or where they may be subject to mechanical injury.

Thermostats and hygrostats should be free from vibration. Thermostats particularly must not be directly in the path of air from an air register, nor mounted on an outside wall, nor placed where hot or cold water pipes may be in the wall behind it.

TO PRODUCE *a uniform quality of candy, Life Savers, Inc., Port Chester, N. Y., have air conditioned the entire plant. Above view is a section of the wrapping and packaging department. (B. F. Sturtevant Co. photo)*

Make This Label a "Must" Specification

WHEN BUYING FLUORESCENT LIGHTING UNITS

● The advantages made possible by the latest developments in Fluorescent Lamps and auxiliary equipment have opened new possibilities for efficient and economical lighting for both general and specific locations.

But the degree to which these advantages are capitalized in a Lighting Unit depends, very largely, upon numerous design and construction factors. To determine whether all of these factors are incorporated into a particular unit requires exacting laboratory and engineering tests... not readily available to buyers and specifiers of lighting equipment.

However, by insisting that the Fluorescent Lighting Unit you buy bears the RLM LABEL you are assured of the finest performance exact adherence to strict quality specifications can insure. This label certifies that the unit bearing it measures up to standards established by RLM STANDARDS INSTITUTE as essential specifications for RLM approved Fluorescent Lighting Units. Salient points of these strict RLM Specifications are:

A. Porcelain Enamel Reflecting Surface for diffusion and durability.

B. 78% Light Output Efficiency. Secured by design of reflector, spacing of lamps and high efficiency of reflecting surface.

C. 72½ Degree Cut-Off, shielding lamp from the side to minimize glare.

D. Two 48" Mazda Fluorescent Lamps. Approximately 100 watts used by lamp and auxiliary.

E. Power Factor and Flicker corrected by New Type Auxiliary. Also equipped with removable and renewable auxiliary starting switches located in the socket.

F. Equipped with Auxiliaries approved by the Underwriters' Laboratories.

Fluorescent Units Produced By The Following Manufacturers Have Been Tested and Approved by Electric Testing Laboratories as Meeting RLM Specifications:

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Des Plaines, Illinois

THE MILLER COMPANY
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Chicago, Illinois

QUADRANGLE MFG. COMPANY
Chicago, Illinois

WESTINGHOUSE ELECTRIC AND MFG. COMPANY
Cleveland, Ohio

WHEELER REFLECTOR CO.
Boston, Massachusetts

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
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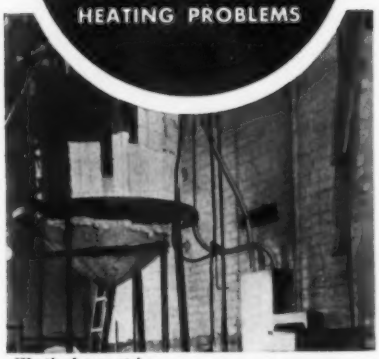
THE CERTIFICATE OF RLM UNIFORM QUALITY

SOLVES
Scores
OF INDUSTRIAL
HEATING PROBLEMS



Westinghouse strip heaters clamped to a compound tank.

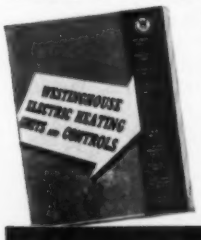
THE
New
WESTINGHOUSE
STRIP HEATER

If you have an unusual heating problem and want to solve it the economical way—consider Westinghouse strip heaters. Available in a wide range of sizes, their use for equipment and space heating purposes is almost limitless.

To make installation easy, Westinghouse provides staggered terminals at one end so either bus bars or wire connections can be used. Heaters are supplied with either steel or chrome-steel sheathing. For complete information see our new catalog.

Note choice of staggered terminals or terminals at either end for easy installation.

Heating Section
WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pennsylvania
J-10185-C



FREE CATALOG

40 pages. Illustrated. Lists wide variety of industrial heating units and controls. Gives sizes, ratings, prices, discounts, specifications. Includes suggestions and timesaving application information. Send for it today.

Westinghouse

With a Motor Drive

When considering a motor drive, the following suggestions will be helpful:

1. Save space by the application of an integral gear-motor.

2. Increase production by obtaining constant speed, with a motor directly connected to the machine shaft.

3. Improve plant power factor by (a) using a synchronous motor, (b) replacing low-speed motors with motors of higher speed, and (c) replacing underloaded motors with motors of smaller capacity and nearer the load requirements.

Plastic Reflectors Reduce Cleaning Costs

"There it is, Pat."
"Okay, Jack."

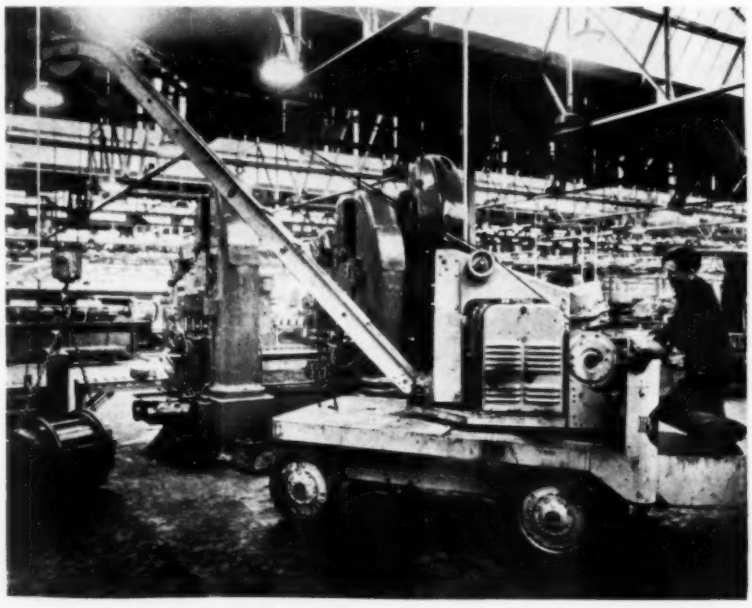
A fraction of a second later, a descending reflector landed lightly in the hands of the receiving end of the maintenance combination cleaning lighting fixtures in an office building. Five minutes later, the remainder of 12 plastic reflectors in one suite had been dismantled for cleaning. The entire job of dismantling, washing, and replacing the 12 reflectors, was done by four men in fifteen minutes.

A time check revealed that the maintenance crew cleaned the plastic bowls in one-half the time required to clean ordinary bowls, or 1¼ min. as against 2½ to 3 min.. This is due to the easier handling of the shock-resistant, light plastic bowls, and to the ease of wiping them out with a damp cloth.

This 11-story building has 1,650 reflectors which are nonplastic except for the 12 mentioned. A little rough calculating will show that the four-man crew requires 8½ days now to clean the reflectors. If all of the 1,650 reflectors were the plastic type, the time required for the four men would be cut to four days.

GOING DOWN!—Likewise cleaning costs, when plastic reflectors are used.

On the basis of each member of the crew being paid $6.00 a day, the saving per cleaning is $96. And, if the reflectors are cleaned once a month, a yearly saving of $1,152 is entirely within reason.

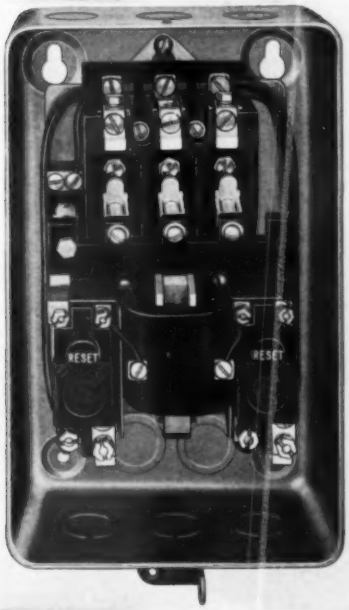


ELECTRIC CRANE TRUCKS used by the maintenance or millwright department often return their cost in a short time. They speed up the dismantling and assembly of machines, resulting in lower maintenance cost and less idle machine time. (Baker-Raulang Co. photo)

UMI

Compact?
Sure! But plenty room for husky fisted maintenance men!

"3C" BULLETIN 6013 • TYPE DS • SIZE O • FORM MA
Across the Line Starter



STARTER GRAM

19____

To A. MOTOROPERATOR

Street and No. PRODUCTION AVE & BUSY ST=

Place ANYWHERE U S A=

NEW SIZE O X-LINE STARTER
PLENTY WIRING SPACE
AGAINST ACCIDENTAL OPERATION
HINGED ARMATURE VERTICAL LIFT MAGNET
BUTTONS PREVENT DESTRUCTIVE ATTEMPTS TO START BEFORE SOLDER HARDENS AFTER
OVERLOAD TRIPS
REGULAR STARTING SERVICE
LARGE ELECTRICAL-MECHANICAL CLEARANCES
LARGE DIAMETER PUSH BUTTONS FULLY PROTECTED
DOUBLE BREAK SILVER TO SILVER CONTACTS
COMMON STOP RESET PUSH
DESIGNED AND BUILT FOR FREQUENT OPERATING JOGGING AND
WRITE FOR MORE DETAILS=
THE CLARK CONTROLLER CO.

RATING

VOLTS	MAXIMUM HORSEPOWER 1 PHASE	3 PHASE
110	1	1½
220	1½	2
440	1½	2
550	1½	2

AVAILABLE

With enclosure or open.

With normally open or normally closed control circuit contacts.

In single phase or polyphase types.

In form MA, with overload reset button in cover. Separate pilot device required.

In form MB, with "Manual-Off-Automatic" switch and reset button in cover.

In form MC, with "Start" and "Stop-Reset" button in cover.

In machine tool gray finish on heavy drawn steel enclosure.

With concentric knockouts on top, bottom, sides and back.

OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

This New ELECTRUNITE Bender Will Help You Use "Inch-Marked" ELECTRUNITE STEELTUBES To Best Advantage

With this new bender and "Inch-Marked" ELECTRUNITE STEELTUBES, you can make any needed type and size of bend easily, quickly and accurately.

The new ELECTRUNITE Bender (Pat. No. 111,870) is a one-piece malleable iron casting, with no moving parts to get out of order. Simple instructions and markings for making stubs, back-to-back bends and offsets are actually built in to the side of the bender so the instructions can never be lost. Standard Code radius bends can be made with less flattening than ever before possible.

Greater Accuracy and Ease Than Ever Before Possible by Making Bends the ELECTRUNITE Way

"Inch-Marked" ELECTRUNITE STEELTUBES and the new ELECTRUNITE Bender were designed to provide you with the ideal combination for making exact bends simply and with little effort. A third help is the new bending tag which accompanies each bender and each bundle of tubing. On it are printed diagrams and detailed directions for making various types of bends.

Thus, with tubing that already is measured to the inch for you and with a bender that predetermines and produces bends to exact size, you can't go wrong if you follow instructions on the tag. That's the ELECTRUNITE way of working more easily and more accurately.

UMI

...More Accurate...More Economical...
Foot-Rule on Every Length of
"INCH-MARKED"
TRUNITE Steeltubes

● Now, when you want to cut a length of ELECTRUNITE STEELTUBES... when you want to make accurate, uniform, predetermined bends... *it's easy to find your mark and keep it.* Every length of "Inch-Marked" ELECTRUNITE STEELTUBES has a foot-rule attractively and clearly printed in blue ink right on the tube. The awkward task of holding a rule against the tube to measure the required distance is ended.

Think what this improvement in conduit can mean to you on the job. Just imagine how much easier it will make measuring, cutting and bending—how it will help you to make more accurate bends, reduce loss due to error or guesswork and produce neater installations. Once your workmen use it, they'll prefer it.

"Inch-Marked" ELECTRUNITE STEELTUBES is being made available through ELECTRUNITE Distributors as quickly as production facilities permit. Use it on a job as soon as possible—and see how much easier it makes electrical installation. Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.

UNDERWRITERS' LABORATORIES, INC. INSPECTED RIGID ELECTRUNITE REG. U.S. PAT. OFF. STEELTUBES Z-48 ELECTRICAL METALLIC TUBING

Now you have two means for identifying genuine ELECTRUNITE STEELTUBES—the original and pioneer electrical metallic tubing. Ask for ELECTRUNITE STEELTUBES and be sure you get it by looking for the inch-marking and this new red and black label on every ten-foot length.

REG. U. S. PAT. OFF. REPUBLIC STEEL

When YOU MAKE YOUR OWN BEARINGS

Use JOHNSON UNIVERSAL BRONZE BARS

Write for FREE CATALOGUE

● The next time you have to turn out a special bearing . . . or a bronze part — try a Johnson UNIVERSAL Bronze Bar. You have over 350 sizes to choose from and every bar is completely machined — I.D., O.D. and Ends. The alloy S.A.E. 64 is the best general purpose bearing bronze available. Complete stocks are carried in every principal industrial center.

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Sleeve BEARING HEADQUARTERS
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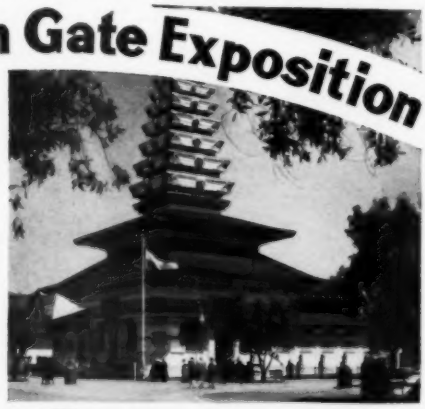
At the Golden Gate Exposition

BRIEGEL METHOD . . .

Used in the Netherlands East Indies Building

"We used BRIEGEL box connectors and couplings for the lighting and fire alarm systems in the Netherlands East Indies Building", states S. Cimino of the Severin Electric Company, San Francisco. "Also for the fire alarm systems in 95% of the buildings and palaces at the GOLDEN GATE EXPOSITION.



TELESCOPE BM SYSTEM

The One Tool Needed Cost Only $1.35

"For economy, time-saving and appearance, we always use BRIEGEL connectors and couplings. You simply slip the fitting over the tube, press the BRIEGEL Indenter twice—and the operation is completed".

Approved by Underwriters Laboratories

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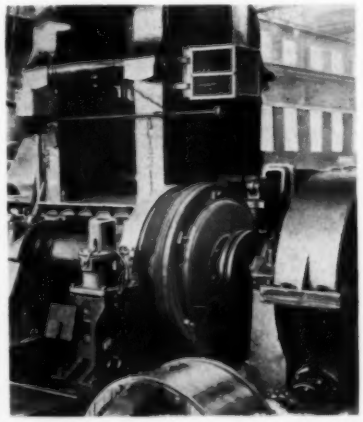
THE M. B. AUSTIN CO., Chicago, Ill. · CLIFTON CONDUIT CO., Jersey City, N. J. · THE STEELDUCT CO., Youngstown, Ohio · NATIONAL ENAMELING & MFG. CO., Pittsburgh, Pa. · CLAYTON MARK & CO., Evanston, Ill. · GENERAL ELECTRIC CO., Bridgeport, Conn. · ENAMELED METALS CO., Pittsburgh, Pa. · TRIANGLE CONDUIT & CABLE CO., Elmhurst, New York City

BRIEGEL METHOD TOOL CO., Galva, Illinois

Magnetic Clutches

Magnetic clutches are electrically operated "couplings" for transmission of mechanical power. They consist of two main members—the field and the armature—which are drawn and held together by magnetic attraction when energized by direct current, and are quickly disengaged by spring pressure when the electric circuit is opened. The clutch drives its load by friction between the face of the armature and friction lining on the field ring.

Applications of magnetic clutches include: (1) mechanical power transmission by functioning as a rigid coupling, (2) accelerating a load after driver has started unloaded, as a drive by a synchronous motor with low starting torque, (3) providing for slip at a predetermined torque in case the driven machine becomes jammed, as for a diesel-driven dredge pump, (4) frequent starting and stopping of driven machine while driving motor is permitted to operate continuously, as for compressor drive, (5) synchronizing or



COMBINATION of a magnetic clutch (right) and a magnetic brake used as a safety stop, disconnects mill from the drive, and simultaneously applies brake for quickly stopping the mill.

mechanically locking together the motion of two rotating drivers, as on rolling mill screwdowns, (6) accelerating and locking one section of a machine in relation to another, as sectional drive for a paper machine, (7) disconnecting a load from the motor to permit quick stopping of a machine when brakes are set suddenly, as on rubber mills.

Magnetic clutches are available with single and double friction faces and in sizes from 7- to 84-in. in diameter. Control may be manual, remote, or automatic, and with provision for high breakaway torque and for low inching torque.

Clutches are rated on a torque basis,

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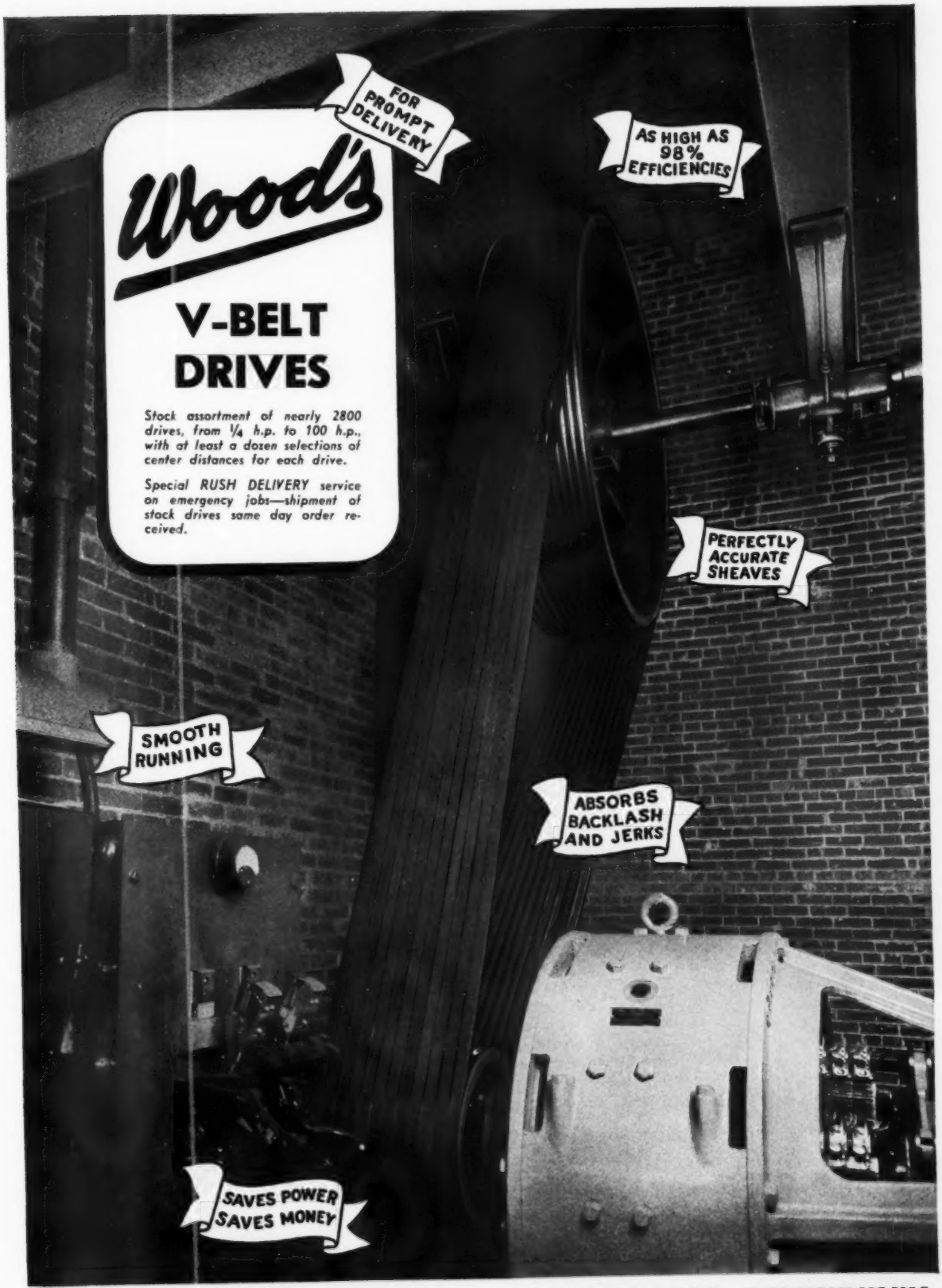
FOR PROMPT DELIVERY
Wood's
V-BELT DRIVES
Stock assortment of nearly 2800 drives, from 1/4 h.p. to 100 h.p., with at least a dozen selections of center distances for each drive.
Special RUSH DELIVERY service on emergency jobs—shipment of stock drives same day order received.
AS HIGH AS 98% EFFICIENCIES
PERFECTLY ACCURATE SHEAVES
SMOOTH RUNNING
ABSORBS BACKLASH AND JERKS
SAVES POWER SAVES MONEY

T. B. WOOD'S SONS COMPANY • CHAMBERSBURG, PENNSYLVANIA

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THE *NEW* BEAVER C-1

Portable Power Unit (without vise) or the C-2 (with vise) will convert your present hand pipe cutting, threading and reaming tools into a modern electric pipe machine to thread ¼ to 8-inch pipe or ¼ to 1¼-inch bolts. They speed up piping jobs — and eliminate the "afternoon slowdown"!

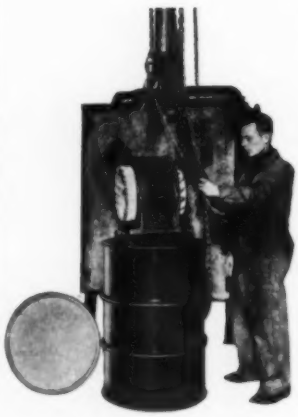
Write for the new 1940 Beaver Catalog!

BEAVER PIPE TOOLS

Highest Quality • WARREN, OHIO • *For 40 Years*

540 Deen Avenue

Get this dipping tank FREE!



Take advantage of this offer today. Simply order 55 gallons of CHINALAK Black Baking Varnish. We will ship initial orders in a special removable head drum that makes a perfect dipping tank.

But this is not all. We will also include, at no extra cost, a special DOLPH thermo-hydrometer and solvent chart.

This is your opportunity to get acquainted with this remarkable insulating varnish at no risk. For this shipment will be made subject to the DOLPH Guarantee that if the material does not prove satisfactory, it may be returned and the full amount charged will be refunded immediately.

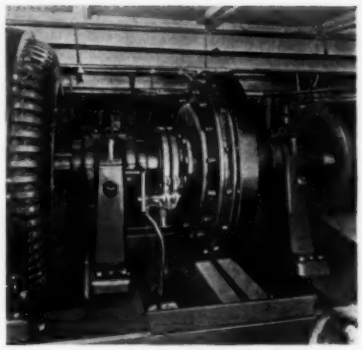
JOHN C. DOLPH CO.

Insulating Varnish Specialists

168-A Emmett St. Newark, N. J.

JOHN C. DOLPH COMPANY
168-A Emmett Street, Newark, New Jersey.
You may ship us 55 gallons of CHINALAK at $1.40 per gallon in a removable head drum.
Also include, at no extra cost, a thermo-hydrometer and solvent chart.

Name .....
Address .....
City ..... State .....



A 40-IN. MAGNETIC CLUTCH connects a 500-hp. 2,200-volt synchronous motor to a pulley driving a line shaft in a paper mill (Cutler-Hammer photos).

therefore, when selecting a unit it is necessary to have the following information: (1) horsepower to be transmitted, (2) clutch r.p.m., (3) duty cycle, (4) type of driver and driven machines, (5) dimensions of shafts and keyways of driver and driven machines, and (6) voltages of d.c. power.

Maintenance—For efficient operation of magnetic clutches, attention should be given to the following points:

1. Inspect as often as the motor.
2. If in storage, protect carefully from accumulation of moisture.
3. When in service, protect from oil and water.
4. Keep lining properly adjusted.
5. Avoid drag when clutch is idling, by having clearance between lining and field ring.
6. On units requiring lubrication, occasionally force cup grease, recommended by clutch manufacturer, into the bearing space.
7. If starts are jerky, reduce clutch driving force by moving field ring lining forward, also see that starter is

***PHOTO-ELECTRIC** temperature control of resistance heater used for heat-treating the tips of automotive valve stems. The photo-electric cell is mounted in the tubular housing. It indicates, through control relays, the correct temperature for turning off the resistance heater. (Electronic Control Corp. photo)*

HE REALIZES THE IMPORTANCE OF "IC"

That's Why He's Installing G-E Air Circuit Breakers on All Branch Circuits

BESIDES adequate interrupting capacity ("I C"), G-E air circuit breakers provide overcurrent protection, with adjustable time delay. And you can restore service at once, safely, just by turning a handle. By providing three-phase interruption, single-phasing of motors, with all its harmful effects, is prevented. Because of their trip-free action, these circuit breakers cannot be held closed against short circuits. They are designed for interrupting ratings up to 80,000 amp.

For Main Circuits He Bought G-E Air Circuit Breakers Assembled as a Completely Enclosed Switchboard

This assembly of G-E air circuit breakers is installed as a unit. All you need do is to connect the leads. Being completely dead-front, it offers the advantage of safety over old-fashioned boards that have exposed live parts.

"I C" = Interrupting capacity

THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They gravely endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices. Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

GENERAL ELECTRIC

290-80

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For Better Service—

INSTALL TRICO

RENEWABLE FUSES
With the famous Powder-Packed Element

KLIPLOK CLAMPS
Lock fuses and clips together

KANTARK FUSES
With genuine fibre tubes (not paper)

COLORTOP PLUG FUSES
The color tells the size

FUSE PULLERS
Pull and replace fuses safely

GLASS OILERS
For motors, line shafts, solid bearings etc

UNBREAKABLE OILERS
"Opto-Matic" Constant level type
Gravity Feed type

WRITE FOR FOLDER CPF-300

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

DRILL HOLES 50-75% FASTER!

Amazing new drill-point contains special metal harder than hardest steel. Goes through concrete, tile, slate, porcelain, etc., 50 to 75% faster. Drills cleaner, more accurate holes. Speeds up installation of expansion anchors. Saves your skilled time for more profitable work. Eliminates noisy hammering, monotonous chiseling. Doesn't splinter fragile work. No special equipment needed—use in any rotary drill. Get *your* share of those extra profits now possible. Send coupon for leaflet.

CARBOLOY COMPANY, INC.
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Carboloy Co., Inc.
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Send free leaflet on Carboloy Masonry Drill-Points, for drilling 75% faster.
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properly connected and properly operated.

8. If clutch force is insufficient to start load, check magnetic gap when clutch is energized, see that lining face is not oily and that driven equipment is not jammed, also measure voltage and current and compare with nameplate marking.

9. If lining wears rapidly, eliminate excess slippage before breakaway or deficient accelerating force, and adjust lining.

10. Check alignment to avoid vibration caused by excessive bearing clearances, displacement of bearings, bending of shafts, and faulty foundations.

Capacitors Save $1,050 Annually for a Village

An annual return of 67 per cent on a capital investment of $1,578 in Pyranol capacitors is expected to be realized by the municipality of Springville, N. Y., according to a recent study.

The capacitors were installed to reduce line losses 32,000 kw.-hr. per year, and save 61,500 kw.-hr. per year that was formerly lost in a synchronous condenser which they replace. At the power rates paid by the village, $1,050 will be saved.

Springville generates a part of its power and transmits it at 2,300 volts a distance of 2½ miles. Improved power factor was necessitated in order to maintain voltage at the load center. To do this originally, an old belt-driven generator was converted into a synchronous condenser. Although the condenser reduced line losses 32,000 kw.-hr. per year, losses in the machine itself were 61,500 kw.-hr. per year.

An installation of 210-kva. of Pyranol capacitors was made. The capacitors effect the same voltage correction, but the loss in them will be only 3,140 kw.-hr. Thus at the end of the year, the capacitors will have saved the line loss of 32,000 kw.-hr. and the synchronous-condenser loss of 61,400 kw.-hr.

Neon Lamps Check Slip-speed

A portable neon-lamp device is used to make slip-speed checks, in the test department of the Reliance Electric and Engineering Co., Cleveland, Ohio.

The device consists of four 115-volt, three-watt, clear neon bulbs mounted in lamp bases on a small board. To this is attached a cylindrical steel hood painted black on the inside. On the back of the board a three-pole, two-way switch is mounted.

These are the tools

It takes hammers and mallets of genuine Java Water Buffalo Rawhide to strike effective blows softly . . . to end losses from battering, cracking and marring.

No fatiguing bounces
No chipping or splitting
No loose heads

For motor maintenance work where delicate insulation must be protected against the work of "pounding in", use these safe, accurate Chicago Rawhide Tools, which outlast all other "soft" hammers.

Stocked by leading Supply Houses.

Hammers in six sizes take replaceable insert faces, seven sizes of Mallets—five with loaded heads.

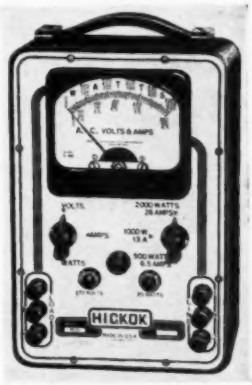
These replaceable faces are the economy feature of Chicago Rawhide Hammers. Accurately fitting, hard coiled faces for the long life malleable heads.

Write for Circular.

CHICAGO Rawhide MFG. CO.
1312 ELSTON AVE · CHICAGO · U.S.A.

1 DOES IT ALL HICKOK

VOLT-AMPERE-WATTMETER



A.C. CIRCUIT ANALYZER

15 Meters in One.

WATTS: 0-20-100 - 500 - 1000 - 2000

Uniform wattmeter scale.

CURRENT: 0-.26 - 1.3 - 6.5-13-26 amps.

VOLTS: 0-130-260.

Also tests electrical appliances from clocks to cooking ranges operating on the three wire Edison Circuit. All necessary leads and connectors available.

This is just one of the many types of Hickok built electro-dynamometer wattmeters.

Write for Bulletin 900.

ADDRESS ALL INQUIRIES TO
THE HICKOK ELECTRICAL INSTRUMENT CO
10514 DUPONT AVE. · CLEVELAND, OHIO, U.S.A.

NEON-LAMP DEVICE held in position for test of slip-speed.

When the unit is to be connected to the 220-volt shop circuit, the switch is thrown in one direction so that two lamps are in series and two in parallel. For use on 440-volt circuits, the switch is thrown in the opposite direction and all four lamps are connected in series.

Measurements are made of slip-speed of a.c. motors operating at less than 100 r.p.m. slip. The tester can count the number of revolutions per minute of a chalk mark on the shaft end, by directing the light on the end of the motor shaft and marking the time with a stop-watch. Synchronous speed minus slip r.p.m. gives motor r.p.m.

Arc Welding Saves $480

Emergency repairs were made by arc welding when one of the hot-water boilers at Seton Hall, East Orange, N. J., was found to have a bad leak.

The McCabe Boiler Corp., Newark, N. J., was called in to do the repair work, stripped the asbestos insulation from the faulty section, and welded a 6-by 24-in. lap-joint patch in place. A

ELECTRIC WELDING, used in emergency repair, saves replacement of hot-water boiler.

Any electric motor—any make—from 1/50 hp to 100 hp can be fitted with new bearings, completely machined, ready to install, instantly available from stock. Ask your electrical wholesaler . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

● *Get the new Bunting Catalog which makes ordering as easy as installation.*

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BRONZE BUSHINGS
PRECISION BRONZE BARS

BEARINGS
BABBITT METALS

Riveted type Shunt with Lifting Clip Projecting from face of Brush.

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CARBON BRUSH QUALITY!

● SUPERIOR CARBON PRODUCTS, INC. manufactures brushes for twenty one motor manufacturers as standard equipment.

SUPERIOR CARBON PRODUCTS, INC. manufactures brushes for motors classed from "flea power" to motors of 6500 H.P. used for steel mill drives.

SUPERIOR CARBON PRODUCTS, INC. manufactures brushes for coal mines, one of which is recognized as the world's largest producer of Anthracite Coal.

SUPERIOR CARBON PRODUCTS, INC. is operated by men who have had years of experience before becoming connected with SUPERIOR CARBON PRODUCTS, INC.—who have been manufacturing brushes for twenty years.

SUPERIOR

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SUPERIOR

"All that the name implies"

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I need some assistance in selecting the best grade for my motors.

Name .....

Company .....

Street .....

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Speediest
little Ratchet Threader
you ever saw

RIDGID No. OR—

Quickly cuts perfect threads on ¼" to 1" pipe and conduit. Die heads snap out easily for changing, snap into ratchet ring from either side —can't fall out. Dies reverse for threading close-to-wall pipe — *no special dies needed.* Separate sets of semi-high-speed tool steel chaser dies, accurately cut, long wearing. A tough all-steel malleable-alloy tool. Patented carriers with all complete sets at no additional cost. Save time, cut better threads—buy at your Supply House.

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AND OTHER MASONRY MATERIALS

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- Straight, true holes without damage to costly building materials.
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- Drill in occupied buildings without noise.

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has many new and interesting items. Send for your copy. Samples of any item mailed upon request.

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NO. 22 CLIPIT—For No. 14 and No. 12-2 wire and No. 14-3 wire.

NO. 23 CLIPIT —For 2 and 3 wire No. 12–No. 10 and No. 8. Gee Vee Clipits are electro galvanized.

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NEW SpeedWay
Not only far more for the money — actually more drill.

A tool and a price made possible by SpeedWay's 30 years' specialization in portable electric tools, and modern production methods. Every new feature. Streamlined, die cast case, forced air cooling, natural grip in line breast plate handle, removable side handle, sliding switch, waterproof cord, molded plug, and a stallproof specially wound high torque, 500 RPM, 115 V Universal SpeedWay Drill Motor.

1" DRILL

If your dealer can't supply, order direct on 10 day trial.

$24.50

Circular Free

SpeedWay Mfg. Co., 1866 S. 52nd Ave., Cicero, Ill.

Westinghouse 400-amp. portable motor-generator welder was used for the job.

By this method the school saved $480 over the cost of replacement. If the boiler had been replaced, it is estimated the school would have been closed for approximately two weeks.

Electronic Device For Safety

Photo-electric devices are operated by a beam of light. The light is projected from a light source to a receiver. When the beam of light is interrupted, relays in the receiver are actuated, either opening or closing a circuit to power-operated apparatus.

The devices are often used as protective equipment for operators. An installation known as a Curtain of Light is shown in the accompanying illustration.

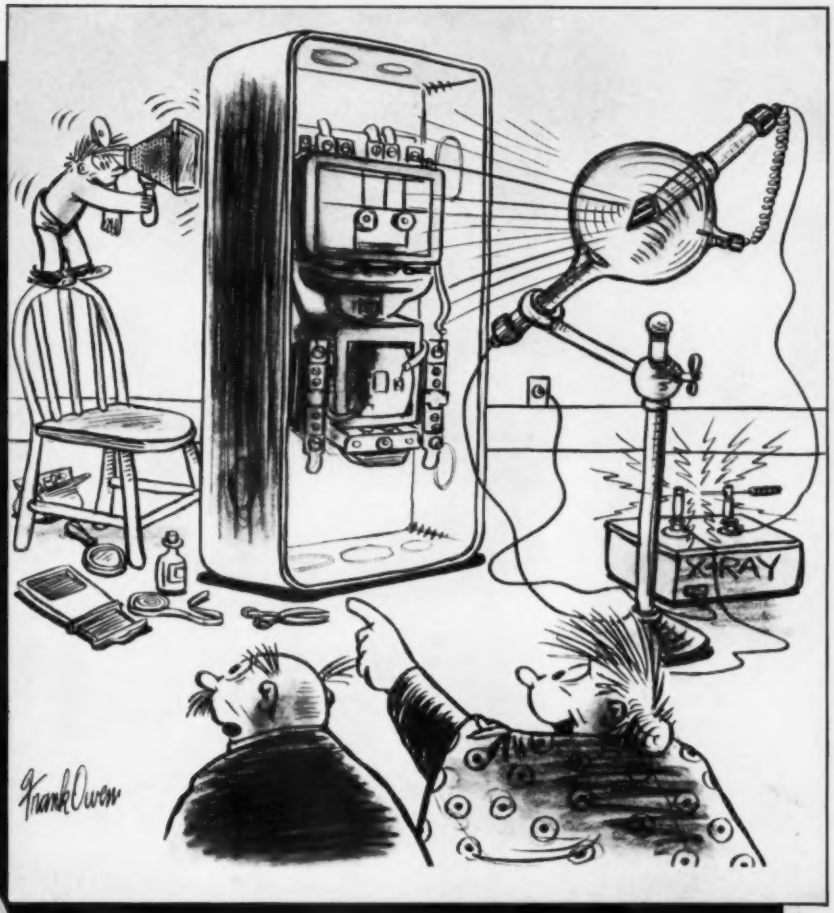
To the left of the operator, the projector can be seen. The pattern of the

***PHOTO-ELECTRIC** control equipment and a curtain of light applied to an embossing press. (Electronic Control Corp. photo)*

curtain of light is readily noticed on the operator's left shoulder and body. Because the light is interrupted by the operator, the press remains in the open position and can be safely loaded or unloaded. When the operator steps back, the light is projected to the receiver, and the press can be closed. The receiver is to the right of the operator, but hidden from view.

A special electronic dwell timer is also used in conjunction with this press (at left of machine), so that the press can be made to remain closed under pressure for a predetermined period of time.

These curtain-of-light units are also applied to large power presses in the various automotive plants where operator safety is a prime requisite, and, yet an increase in production is available because of frictionless control.



Simplicity—that is the key to this starter's performance. The movable contacts are mounted on a solenoid plunger, forming the only moving part. There are no bearings—hence, practically no friction.

"Even with his X-ray machine he can't find any trouble in there!"

You won't find any trouble in an Allen-Bradley solenoid starter either. Dust doesn't bother these contacts. The double break, silver alloy contacts on Allen-Bradley solenoid starters never require cleaning or filing. Of course, flexible jumpers have been eliminated. There are no pivots, bearings, and pins to corrode or gum up and delay switch action. No starter has so few moving parts. There are no complicated mechanisms. Installation is remarkably easy, too. Allen-Bradley solenoid starters have generous wiring space, accessible terminals, white interiors, and knockouts on all sides and back. Try these rugged Allen-Bradley solenoid starters on your toughest jobs and see for yourself how well they perform.

ALLEN-BRADLEY

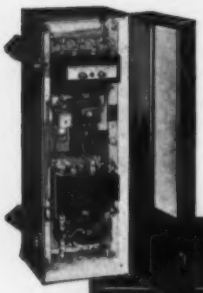
SOLENOID MOTOR CONTROL

QUALITY

How to get VELVET-SMOOTH ACCELERATION

Avoid Shock
to gears and connected machinery

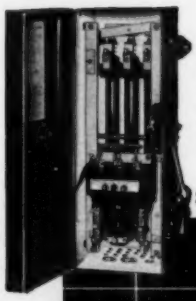
There are many applications where it would be highly desirable to start squirrel-cage motors smoothly, without shock—either to improve the product or to reduce wear and tear on belts, gears, and connected machinery. Here is where one of the starters described below fits ideally into the picture.



For Automatic Starting

The Bulletin 740 starter is controlled by push buttons or other pilot device. The Bradleyunit compression resistors can be easily adjusted to meet exactly the starting torque requirements of the motor load.

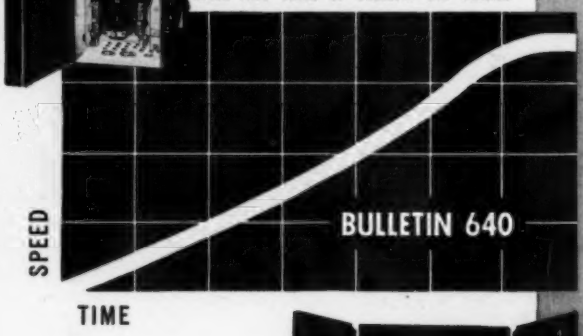
SPEED-TIME CURVE OF BULLETIN 740 STARTER



For Hand Starting

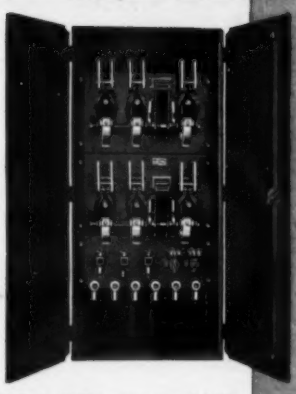
With the Bulletin 640 starter, the operator has the motor starting speed under his full control. Thus, shock to connected machinery can be eliminated. By reducing machine wear and tear, maintenance expense is saved.

SPEED-TIME CURVE OF BULLETIN 640 STARTER



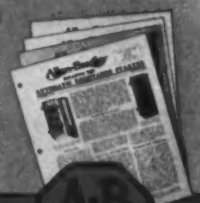
Large and Small Sizes for Every Industrial Need

Allen-Bradley compression resistance starters have been used by industry for many years to control conveyors, textile machines, punch presses, wire drawing machines, line shafts, V-belt drives, band saws, chain drives, and other such equipment. Available in capacities up to 250 hp, 220-440-550 v.



Bulletin 740 starter, rated 250 hp, 220 volts, showing main contactors and auxiliary relays.

Send for these
REDUCED-VOLTAGE STARTER BULLETINS



Includes bulletins on manual and automatic resistance type starters and on automatic transformer type starters.

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Please send me your bulletins on reduced-voltage starters.

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VENTILATING EQUIPMENT

1. A folder illustrating and describing Ventrola ventilating equipment for use in homes, offices, stores. McLaughlin Ventilator Co.

FARM WIRING

2. A new farm wiring handbook, consisting of 28 pages of data and illustrations. It covers the requirements of the average farm. General Electric Co.

TOOLS

3. Catalog No. 41 consisting of 52 pages of data on portable electric tools and accessories. Separate price list is included. Skilsaw, Inc.

LUMINARIES

4. Leaflet 61-152 describing fluorescent luminaries with aluminum reflectors, designed for general or supplementary industrial lighting applications. Westinghouse Electric and Manufacturing Co.

CONNECTORS

5. A folder illustrating and describing Burndy Servits and connectors for overhead distribution. Burndy Engineering Co., Inc.

LIGHTING EQUIPMENT

6. Catalog No. 12 featuring lighting equipment for stores, schools, hospitals, institutions, office buildings and public buildings. Full-O-Lite Corp.

CAPACITORS

7. A 300-page book entitled "Electrolytic Capacitors" of interest to engineers and servicemen. It gives practical information on specific characteristics, applications, testing. Cornell-Dubilier Electric Corp.

INDUSTRIAL WIRING BOOK

8. Publication 51-919, entitled "Adequate Wiring for Industry." Has many illustrations and can be used as check list in factories to determine whether existing wiring permits efficient production. General Electric Co.

LIGHTING EQUIPMENT

9. Catalog No. 36 illustrating and describing fluorescent lighting units known as Utility Flu-O-Flector and Duofluo luminaire. Edwin F. Guth Co.

HEATING UNITS

10. Catalog 28-000 featuring new and improved electric heating units and controls, designed for industrial applications for heating liquids, solids and air. Westinghouse Electric & Mfg. Co.

LIGHTING FIXTURE

11. Bulletin F-18 describing and illustrating "Two-Forty" industrial lighting fixture for fluorescent lamps. Day-Brite Lighting, Inc.

SIGNALING SYSTEMS

12. Bulletin No. 5070 illustrating and describing clocks, paging and signaling systems for schools, hospitals and institutions. Schwarze Electric Co.

MOTORS

13. A 12-page folder featuring electric motors for the farm. Many illustrations and a summarized data guide chart on motors and control. General Electric Co.

VENTILATING EQUIPMENT

14. An 8-page folder on comfort ventilation in commercial and industrial establishments. Gives suggestions for selection and location of proper equipment. Air Controls, Inc.

15. Bulletin No. 149 describes mercury vapor transformers for indoor and outdoor applications. Also explains characteristics of mercury vapor lighting. Acme Electric & Mfg. Co.

FLOODLIGHTING POLES

16. Catalog No. 70 illustrating and describing steel floodlighting (Monotube) poles, for sports field lighting, pump island and area lighting. Tables of dimensions and mounting arrangements are given. Union Metal Manufacturing Co.

GEARS

17. Catalog 110 consisting of 256 pages of listings and illustrations on gears, reducers, cog belts, sprockets, bearings, pulleys and chains. Brad Foote Gear Works.

LIGHTING EQUIPMENT

18. Bulletin No. 41 contains information on lighting equipment for various applications, such as architectural, theatrical, photographic, decorative and commercial purposes. Kliegl Bros.

MOTORS

19. Bulletin No. 118 illustrates and describes Type AA induction motors, squirrel-cage for two and three phase alternating current circuits. Reliance Electric & Engineering Co.

CONNECTORS

20. Catalog No. GX41 features Gedney bonding and grounding fittings, couplings, conduit fittings, connectors, fixture fittings, service entrance fittings. Heron Electric Sales Corp.

RELAY

21. Bulletin F-2 illustrates the new synchronous motor driven time delay relay. It tells what it does, its uses, design and construction. R. W. Cramer Co., Inc.

RATINGS ON DRIVES

22. Revised catalog section, No. 151, covering new horsepower ratings for multiple V-belt drives. It provides engineering data on selection of size of belt for horsepower rating, speed, center distances and sheave diameters. Allis-Chalmers Mfg. Co.

FLUORESCENT UNITS

23. Bulletins illustrating and describing fluorescent utility units for commercial and industrial uses. Lumalite Products Co.

SWITCHES

24. Circular No. 315 describes six different types of enclosures for safety switches, motor starters, circuit breakers and service equipment for special applications, in various locations where dust or volatile fumes are prevalent. Trumbull Electric Mfg. Co.

(Continued on page 66)

FLUORESCENT FIXTURES

25. Catalog No. 97 illustrating and describing fluorescent lamp fixtures for one, two or three lamps. Tables, diagrams and prices included. Overbagh & Ayres Mfg. Co.

INSTRUMENTS

26. Leaflet No. 2815 describing instrumental test kits for electrical contractors and plant electricians. They contain ammeter, voltmeter and transformer. Herman H. Sticht & Co.

CIRCUIT BREAKERS

27. Descriptive data 29-530 illustrating and describing "nofuze" circuit breakers including "De-ion" for a.c. and d.c. lighting and power circuits; "Flipon" light duty breakers for industrial and residential use and type "M" multi-breakers for applications requiring fuses of 30 to 100 amperes capacity. Westinghouse Electric & Mfg. Co.

RELAYS

28. A circular featuring Autelco Jr. relays and listing engineering data, dimensions, diagrams and prices. Automatic Electric Co.

DYNAMOMETERS

29. Folder GEA-2924 describing inductor-type dynamometers. Illustrations and construction diagram are shown. General Electric Co.

WIRE AND CABLE MANUAL

30. A pocket size manual consisting of 270 pages containing tables and data for electrical engineers, contractors and wiremen, on wire and cable. Simplex Wire & Cable Co.

SAFETY SWITCHES

31. Leaflet 29-550 describing safety switches for industrial and general purpose applications. Westinghouse Electric & Mfg. Co.

BEARINGS

32. Catalog No. 400 consisting of 76 pages of data on bronze bearings, bushings, bars, motor bearings, babbitt and graphited bronze bearings. Johnson Bronze Co.

TRANSFORMERS

33. Bulletin 401-IT featuring oil burner ignition transformers designed for use with domestic and industrial burners. Electrical and dimensional data are included. Jefferson Electric Co.

WIRING DEVICES

34. Catalog No. 40 consisting of 96 pages of illustrations and data on the complete line of wiring devices. It is classified in groups for convenient selection. List price Bulletin 1, 20 pages, is included. The Bryant Electric Co.

HEATING UNITS

35. Electric heating unit catalog with bulletins on cartridge, strip, immersion, tubular and ring units; industrial heaters and devices; temperature controls. Watlow Electric Mfg. Co.

VENTILATING EQUIPMENT

36. A 12-page folder illustrating and describing DeBothezat Bifurcator, ventilating equipment designed for conveying corrosive, high temperature and hazardous fumes or gases. DeBothezat Ventilating Equipment Division, American Machine and Metals, Inc.

INSTRUMENT

37. Bulletin SN-1 featuring automatic synchronizer used for controlling circuit breaker closure of a.c. generators in paralleling to a common bus. Burlington Instrument Corp.

FUSE LINKS

38. Bulletin No. 218-A discusses advantages in fusing low-voltage, secondary distribution systems. It presents a new line of indicating secondary links. Schweitzer & Conrad, Inc.

FANS

39. Catalog featuring complete line of Signal fans, including "Challenger" line of vent fans. Signal Electric Mfg. Co.

VOLTAGE REGULATOR

40. Bulletin B-6056, illustrating and describing new three phase, AFR ⅝% step feeder voltage regulators. Allis-Chalmers Mfg. Co.

LAMPS

41. A 4-page folder giving technical data and prices on complete line of G-E fluorescent mazda lamps and auxiliary equipments. General Electric Co.

CAPACITORS

42. Catalog No. 20 consisting of 18 pages of data, illustrations, tables and curves on capacitors for industrial applications. John E. Fast & Co.

SIGN AND FLOODLIGHTING STANDARDS

43. Catalog No. 69 outlines standards for sign and floodlighting installations. Construction details and illustrations are shown. Union Metal Manufacturing Co.

INSTRUMENTS

44. Folder illustrating and describing the Fluortest instruments for testing in the fluorescent lighting field. Zephyr-Lite Manufacturing Co.

ATTIC VENTILATION

45. Bulletin No. 40 features Coolvent, a system of attic ventilation for cooling of homes. Performance data and illustrations are shown. Autovent Fan & Blower Co.

LIGHTING EQUIPMENT

46. Catalog C-141 consisting of 36 pages of illustrations and descriptions on this line of lighting equipment. Charts and engineering data are included. Art Metal Company.

FITTINGS AND DEVICES

47. A loose-leaf catalog illustrating and describing the Penn-Union line of electrical conductor fittings and devices for any combination of tube, bar, wire and cable. Penn-Union Electric Corp.

FLUORESCENT LAMPS

48. A folder featuring fluorescent daylight lamps for drafting tables, work benches, and desks. Illustrations, and diagrams are given. Miller Co.

SIGNAL SYSTEMS

49. A 72-page catalog describing and illustrating hospital signal sys-

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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Two gang adjustable floor box with No. 208 receptacle in one section. One cover plate with ½" flush brass plug and the other cover with 2" flush brass plug.

No. 130 Adustable Water Tight Floor Box

No. 130 Box with No. 207 Bell Nozzle. Cut-away view illustrates how tapered unit receptacle fits tapered opening in adjustable ring. Cover plate 3½" — overall height 3½".

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tems, including nurses' call; patient-and-nurse communication; paycopathic hospital signalling; doctors' paging and registering systems; night lights. Connecticut Telephone & Electric Corp.

CAPACITORS

50. An 8-page replacement guide for motor starting and industrial motor capacitors. Dumont Elec. Co., Inc.

LIGHTING FIXTURE

51. A 4-page folder illustrating and describing a two-light fluorescent fixture for general illumination of industrial areas. The Miller Company.

VENTILATING EQUIPMENT

52. A booklet, consisting of 24 pages, of data and installation photographs of Rex Airate equipment for commercial and industrial cooling and ventilating. Air Controls, Inc.

LIGHTING EQUIPMENT

53. A folder illustrating and describing fluorescent lighting equipment for use in offices, industries and homes. Ritter Dental Mfg. Co., Inc.

MOTORS

54. Bulletin GEA-2915A outlining Type KC ⅛ to ¾ hp. general-purpose capacitor motors. It features applications, construction, characteristics, modifications, ratings and advantages. General Electric Co.

INTERCOMMUNICATING SYSTEM

55. A folder illustrating and describing the Telematic system, a 5-station Dictograph intercommunicating system for use in small offices and business organizations. Dictograph Sales Corp.

FUSES

56. Catalog Folder 300 is entitled "14 Big Trouble Savers." Contains specifications and illustrations of all types of fuses. Trico Fuse Mfg. Co.

VENTILATING EQUIPMENT

57. A new 18-page bulletin, FU-22, on air circulating and ventilating equipment, containing a discussion of where and how to use this type of equipment for cooling and ventilating purposes. Wagner Electric Corp.

SWITCH

58. Bulletin GEA-1184D describes a.c. magnetic motor starting switch for squirrel-cage motors or as primary switch for wound-rotor motors. General Electric Co.

CAPACITORS

59. Descriptive data 49-120 covers Type FP dust tight capacitors for use in industrial plants. For indoor use only. Westinghouse Elec. & Mfg. Co.

FANS

60. Catalog No. X-3649 listing many types of fans, including desk and stand fans, air circulators, ceiling fans, exhaust and ventilating fans. Illustrations, descriptions and list prices are given. Emerson Electric Mfg. Co.

REFLECTORS

61. Folder No. P.S.-5 describing Para-Sphere reflectors for infra-red lamps. It outlines advantages of infra-red equipment and gives specifications of various types of reflectors. Fostoria Pressed Steel Corp.

GUIDE FOR WELDING

62. A guide to welding 30 different metals and alloys has been printed in chart form. Recommended welding method, flame adjustment, welding rod and flux for each is shown. Linde Air Products Co.

SPEED PULLEY

63. A 4-page bulletin describing Speedmaster variable speed pulley, tells how stepless speed delivery may be obtained. Speedmaster Co.

TIMERS

64. Bulletin D-5 outlines synchronous motor driven automatic reset timers for use in connection with photo enlarging machines, X-ray machines, heating controls, testing application and signal systems. R. W. Cramer Co., Inc.

INDICATOR

65. Bulletin No. 740 illustrates and describes the Velox speed indicator, a high speed chronometric hand tachometer, for speeds up to 100,000 RPM. Herman H. Sticht & Co.

LIGHTING

66. A 4-page folder and price sheet illustrating and describing this novel line of fluorescent lighting. Diffusolier Company.

CHIMES

67. Catalog No. 37, consisting of 16 pages of illustrations and descriptions of electric door chimes, bell, signalling, toy and special transformers. A. E. Rittenhouse Company, Inc.

MOTORS

68. A 4-page bulletin describing a.c. and d.c. fractional horsepower motors for small industrial machines and home appliances. Westinghouse Electric & Mfg. Co.

TELEPHONE SYSTEMS

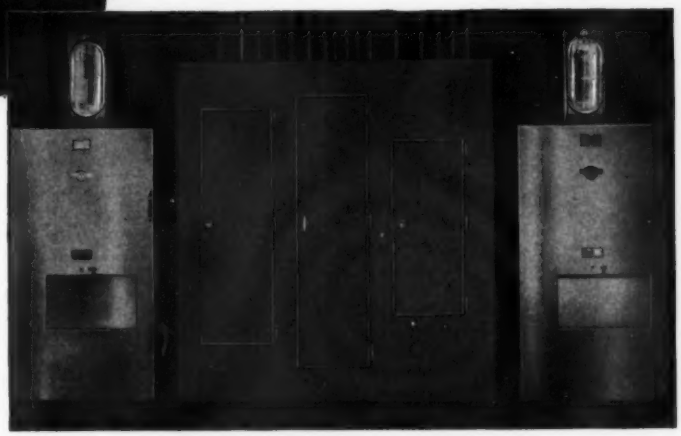
69. A 36-page catalog covering apartment house telephone systems, including vestibule boxes, button directories and phones, suite phones, tradesmen's phones, janitors' annunciator-phones, switchboards, electric door openers and installation equipment. Connecticut Telephone & Electric Co.

TIMERS

70. A folder listing various uses for time switches, interval timers and flashers. Automatic Electric Mfg. Co.

BETTER JOB.....COSTS LESS

with the **TRUMBULL**
SERVICE ENTRANCE *and*
TRANSFORMER SWITCH



The conventional installation with separate units and interconnecting wiring, mounted on a large back-board.

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Simplified unit installation of two TRUMBULL Service Entrance and Transformer Switches on either side of a Trumbull Converti-Fuse Distribution Panelboard. A safe, neat, compact, convenient and economical installation.

FUSIBLE ENTRANCE SWITCH, TRANSFORMERS, CURRENT METER AND METER TEST BLOCK INSTALLED IN A SINGLE CABINET.

Even a glance at the two photographs above shows the obvious advantages in appearance, convenience and efficiency obtained by this compact, modern installation for apartments, stores, hotels, schools, industrials, where current transformers are part of the entrance equipment.

What does not show in the pictures is the fact that the cost of this all-in-one unit is usually very much less than the old type of installation.

You save a lot of wiring, conduit and fittings. You save the cost of a large mounting board or panel. You save time. And you do a better job.

Every detail is of typical Trumbull quality . . . a heavy duty "R.B.A." Type Switch with "Vystipe" Fuse Clamps and solderless lugs for ease in wiring. Adjustable mounting plates and lugs for Transformers. Meter and Meter Test Block mounting plates, baked aluminum finish inside and out, fuse panel in cover, facilities for locking switch and sealing cover.

Listed in the Trumbull Catalog and Trumbullist.

THE TRUMBULL ELEC. MFG. CO. — PLAINVILLE CONN. U.S.A.

TRUMBULLAIDS FOR ELECTRICAL CONTRACTORS — The Trumbull Products shown in these advertisements are illustrated, described and listed in the Trumbullist, in individual circulars and in Trumbull "Cheer". Be sure your name is on our lists to receive all of these important TRUMBULLAIDS.

NEW YORK - PHILADELPHIA - BOSTON - CHICAGO - DETROIT - LUDLOW, KY. - ATLANTA - NASHVILLE - LOS ANGELES - SAN FRANCISCO - SEATTLE

In the News

NISA Convention at Detroit

Motor shop men gather to review new methods, exchange ideas — Sievert the new President

Representatives of over 200 electric motor service shops attended the seventh annual convention of the National Industrial Service Association at the Book-Cadillac Hotel in Detroit, Aprill 22–24. J. M. Pilmer presided.

Keynote of the record breaking 1940 convention was struck by F. W. Willey, Willey-Wray Electric Co., Cincinnati, who urged planned shop modernization based upon a cooperative study of the best available shop experience and methods to keep pace with parallel progress in the industries served toward "elevation of the electrical service industry" on a broad front.

After, Mr. Willey then presented the first complete report of the work of the National Certification Board. Special attention, he said, has been centered on shop and departmental layouts to develop an efficient usable pattern for the application of modern shop methods and machinery.

Following the shop modernization theme, P. M. Potter, Potter & Rayfield, Inc., Atlanta, presented a number of case studies of increased production and reduced costs through the use of modern shop machinery. E. C. W. Johnson, Indianapolis, outlined the opportunities the independent service shop has to give better customer service.

Further detailed studies of shop efficiency problems and their solution from the shop foreman's point of view were given in two papers by C. Henry Scheidt, Baltimore, and A. H. Wolf, Evansville.

What the manufacturer expects and the profit possibilities in the "authorized service station" was outlined by Fred E. Wright, of Cutler-Hammer, Inc.

The process, methods and necessary shop equipment for transformer rewinding were described by A. A. Gruening, Des Moines. Ellis M. Fagan, Little Rock, reviewed the business possibilities and limitations from a broad experience with transformer rewinding work.

A report on the annual survey of rewinding prices from figures submitted by 52 concerns was presented by C. W. Nunn, Evansville, for the cost data committee. A survey of overhead costs was reported by Shelden F. High, Cincinnati. Activities of local groups were reviewed by J. F. Ferrari, Chicago, president of the Central District of NISA.

J. H. Nelson, Knoxville, spoke on experiences with high temperature wedges. "Does a Night Man Pay" was the subject of a report by A. A. Gruening, Des Moines. A. F. Anderson, Nashville, discussed selling quality rewind jobs. A time study of motor repairs work was presented by F. R. Hannon, Canton. J. E. Launder, Kansas City discussed accessory sales.

Used and rebuilt motor sales problems were outlined by Arthur Wagner and C. A. Sievert, Chicago. H. E. Grant, Nashville spoke on fractional horsepower motor repairs. M. J. Wohlgemuth of Westinghouse discussed the solution of power factor correction problems.

The following officers were elected to serve through the coming year—president, C. A. Sievert, Sievert Electric Co., Chicago; vice president, Leonce Bonnecaze, Jr., Best Electric Co., New Orleans; secretary, C. J. Cannon, Neimmo Electric Co., Detroit; treasurer, A. L. Brown, Alfred L. Brown Associates, Worcester; executive secretary, S. N. Clarkson, New York City.

Two new members were elected to the Board of Directors: E. T. James, Northwestern Electric Co. of Chicago; and R. B. Turner, Turner Electric Co. of Windsor, Ontario.

A very successful entertainment program was arranged by a local committee. It included a banquet, a joint dinner with the Industrial Engineers of Detroit, a trip through the Ford Motor Co. plant and other features.

Exhibitors displaying products in the exhibit hall were Ideal Commutator Dresser, Potter & Rayfield, General Electric, Square D, Roller Smith, Universal Electric Products, Gregory Electric, Industrial Engineering Equipment, Insulation Manufacturers, Cutler-Hammer, Weltronic, John C. Dolph, Belden Wire, Bulldog Products, Baldor, Wagner, Prehler Bros., Insulation, Inc., Essex Wire, Century, Owens - Corning Glass, Helwig - Speer, Acme, Lima Armature and Westinghouse.

"But, Madam, you can't have indirect lighting on a tennis court!"

YOUNGSTOWN "BUCKEYE CONDUIT" IS LIKE AN EXTRA HELPER ON THE JOB

Made from a steel developed for this work alone, the conduit has a ductility which is uniform throughout each length. Work with a hickey is fast and quick. Your workmen can make real time when the conduit bends on comparable radii with the same flexibility and there's no back lash in the pipe. Threads, cut once, are clean, need no chasing.

Buckeye Conduit is lined with satin-smooth lacquer lining, flexible but tough. Fish wires won't scratch through, and when you push cable on short runs, there will be no cracked lining to fight.

Speed on a job means profit, and Youngstown Buckeye Conduit is the first step to making time and saving money on any installation.

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - - - YOUNGSTOWN, OHIO

Ask your distributor for Youngstown Conduit - Pipe and Tubular Products - Sheets - Plates - Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and Spikes. 26-10B

YOUNGSTOWN

1940 N.E.C. REWIRING TABLES

Commercial use of small diameter wires has preceded formal publication of the rules pertaining to its installation in the 1940 revision of the National Electrical Code by several months. Through special permission of local inspection authorities, electrical contractors are rewiring existing systems with the new wires.

To help contractors and local authorities adjust local practice under special permission to conform with the official rules as they will appear in the National Electrical Code, tables 6, 7, 11, 14, 15 and 19 concerning the number of small diameter conductors which may be installed in existing raceways, and the dimension of conductors and conduits are presented here.

SNAPSHOTS FROM the Tennessee Electrical Contractors Association Meeting in Memphis; (Top left) Guest speakers, Joseph A. Fowler, formerly active in electrical contracting affairs now executive director of Memphis Housing Authority and H. J. Reinhardt, vice-president Frank Adam Electric Co. of St. Louis. (Top right) Executives Philip Sweet of Chattanooga, secretary-treasurer and J. C. Campbell of Nashville presiding. (Bottom) Convention committee (left to right) H. C. Watson, George Dichtel, newly elected president A. S. Thompson, C. O. Davis, Fred Jones and L. H. Lanahan.

TABLE 6 Number of Conductors in Conduit or Tubing

Small diameter building wire.
Types RHT and RPT.
600 volt.
One to nine conductors

For rewiring in existing raceways as provided in sub-paragraph e of sec. 3005.

Size of conductor	No. of conductors in 1 conduit or tubing								
	1	2	3	4	5	6	7	8	9
14	½	½	½	½	½	½	½	½	¾
12	½	½	½	½	½	¾	¾	¾	¾
10	½	½	½	½	¾	¾	¾	¾	1
8	½	¾	¾	¾	1	1	1	1	1¼

Note — type RHT conductors recognized in sizes # 14 to #8; type RPT conductors recognized in sizes #14 to #10.

TABLE 7 Number of Conductors in Conduit or Tubing

Synthetic, type SN and Latex, type RU, 600 volt—one to nine conductors.

For rewiring in existing raceways as provided in sub-paragraph e of sec. 3005.

NO. OF CONDUCTORS IN 1 CONDUIT OR TUBING

	1	2	3	4	5	6	7	8	9
14	½	½	½	½	½	½	½	½	½
12	½	½	½	½	½	½	½	½	¾
10	½	½	½	½	½	½	¾	¾	¾
8	½	½	½	¾	¾	¾	1	1	1
6	½	¾	¾	1	1	1¼	1¼	1¼	1¼
5	½	¾	¾	1	1¼	1¼	1¼	1¼	1½
4	½	¾	1	1	1¼	1¼	1¼	1½	1½
3	½	1	1	1¼	1¼	1¼	1½	1½	2
2	¾	1	1	1¼	1¼	1½	1½	2	2
1	¾	1¼	1¼	1½	1½	2	2	2	2½
0	¾	1¼	1¼	1½	2	2	2	2½	2½
00	¾	1¼	1½	2	2	2	2½	2½	2½
000	¾	1½	1½	2	2	2½	2½	3	3
0000	1	1½	2	2	2½	2½	3	3	3

Note — Type SN conductors recognized in sizes # 14 to 0000; type RU conductors recognized in sizes #14 to #10.

Table 11, Combinations of Conductors, with dimension tables 14, 15 and 19 may be used to determine capacities of existing raceways for combinations of wires of different sizes. Tables 6 and 7 are also based on the conduit fill percentages given in Table 11.

For rewiring existing raceways, 3 or more conductors may occupy 50 per cent of the conduit cross sectional area. Small diameter building wires, type RHT are recognized in sizes number 14 to 8, type RPT in sizes number 14 to 10, type RU in sizes number 14 to number 10, type SN in sizes number 14 to number 0000.

TABLE 11—Combinations of Conductors

For groups or combinations of conductors not included in tables 4 to 10, it is recommended that the conduit or tubing be of such size that the sum of the cross sectional areas of the individual conductors will not be more than the percentage of the interior cross sectional area of the conduit or tubing as shown in the following table

PER CENT AREA OF CONDUIT OR TUBING

	No. of conductors				
	1	2	3	4	More than 4
Conductors (not lead covered)..	53	31	43	40	40
Lead covered conductors.....	55	30	40	38	35
For rewiring existing raceways with conductors of thinner insulation as provided in 3005d and e.....	60	40	50	50	50

TABLE 14—Dimensions of Conductors

Small diameter building wire. Types RHT and RPT.

Size AWG	Approx. diam. in inches	Approx. area in sq. in.
14	.162	.0206
12	.179	.0252
10	.200	.0314
8	.261	.0535

TABLE 15—Dimensions of Conductors

Synthetic Insulation, type SN.
Latex Insulation, type RU.

Size AWG	Approx. diam. in inches	Approx. area in sq. in.
14	.139	.0133
12	.147	.0170
10	.168	.0220
8	.227	.0406
6	.314	.0775
4	.363	.1035
2	.423	.1406
1	.486	.1935
0	.537	.226
00	.583	.267
000	.634	.316
0000	.692	.376

Note — Latex insulation, type RU, recognized in sizes No. 14, 12 and 10

TABLE 19—Dimensions of Conduit or Tubing

	Internal diam. in inches	Area sq. inches
½	.622	.30
¾	.824	.53
1	1.049	.86
1¼	1.380	1.50
1½	1.610	2.04
2	2.067	3.36
2½	2.469	4.79
3	3.068	7.38
3½	3.548	9.90
4	4.026	12.72
4½	4.506	15.95
5	5.047	20.00
6	6.065	28.89

RECORD CROWD AT BOSTON TRADE SHOW

Boston's 1940 Electrical Trade Show was the largest ever sponsored by the Electrical Manufacturers' Representatives

IS THIS FEATURE ON THE TIME-SWITCH YOU NOW BUY?

A LOW SPEED HIGH TORQUE SELF-STARTING MOTOR ASSURES LONG TROUBLE-FREE LIFE...

240 revolutions per minute is the speed of the synchronous motors used in Sangamo Time-Switches. This low speed motor design is in itself a guarantee not only for long trouble-free life, but also for the accurate and dependable performance of the motor. This feature, too, means fewer reduction gears and less friction—therefore less wear. Thus the motor alone, makes Sangamo Time-Switches a far better buy, even though they may cost a little more.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

BI-METAL PROTECTS

Ask your Westinghouse Representative for this Bi-METAL demonstration

MAKE THIS TEST YOURSELF . . . A strip of Bi-Metal and a match are all you need to prove to yourself the time and money-saving advantages of Bi-Metal Protection. Ask your Westinghouse Representative for a Bi-Metal Demonstration Kit.

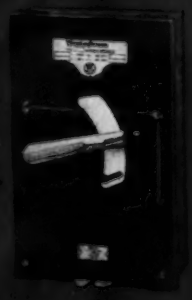
HERE'S HOW BI-METAL SAVES MONEY . . . GIVES BETTER PROTECTION

Two different metals bonded together, when heated always bend in the same direction. The heat from short circuit or continued overload currents causes the Bi-Metal, which is exactly calibrated to the job at the factory, to act and open the circuit. Because of Bi-Metal's characteristics, its accuracy never changes, regardless of the number of operations. There's nothing to replace . . . there's nothing to wear out.

YOU PAY NO MORE FOR BI-METAL PROTECTION IN THIS WESTINGHOUSE EQUIPMENT

THERMOGUARD MOTOR
Single-phase sizes up through 2 hp, incorporate bi-metal protection.

MOLDED CIRCUIT BREAKER
Bi-Metal eliminates fuses. "De-ion" arc quenchers give positive. Operates with ordinary current.



"DE-ION" LINESTARTER
Magnetic motor starter. Bi-Metal overload protection. "De-ion" arc quenchers save contacts.

Westinghouse

W WESTINGHOUSE ELECTRIC

UMI

All Circuits Automatically

..WITHOUT FUSES

You Get It For Both Power and Lighting Circuits in NOFUZE PANELBOARDS

Bi-Metal protection for lighting and power circuits eliminates the necessity of replacing fuses. Saves lost production time, saves unnecessary interruptions to service.

The breaker trips automatically before dangerous current values are reached. Temporary or harmless overloads do not operate the breaker. When the breaker trips, service is restored by a simple movement of the handle. There is nothing to replace.

Nofuze panelboards are assembled from either of two types of breakers—the "Deion" breaker for power; lighting and heating circuits, and the Multi-Breaker for low-cost lighting panelboards. You can have Multi-Breaker convenience at approximately the same cost as conventional fused equipment.

Ask your nearest Westinghouse wholesaler, district office, or industrial agent to show you the economy of Nofuze panelboards.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

Motors and Control

[FROM PAGE 72]

Club of New England. This, the seventh show produced by this group, was held at the Exposition Hall in Boston Garden on April 3, 4 and 5. There were 168 booths that displayed the products of some 600 manufacturers.

More than 11,000 visitors spent many hours at the various exhibits. These industry representatives included plant executives, utility and plant technical staffs, contractors, maintenance men, plant superintendents, consulting engineers, inspectors, motor shop men, electrical wholesalers and a host of others interested in the development of the new products shown. The well-organized publicity and promotion of the show was richly rewarded, for visitors poured in from all parts of Maine, New Hampshire, Vermont, Rhode Island, Connecticut, Massachusetts.

Especially interesting was the diversity of products displayed. The displays ranged from a few exhibitions of household appliances, through the complete electrical construction line to equipment and its application. For the contractor there were elaborate displays of commercial and industrial lighting of both the incandescent and fluorescent types, conduit and raceways, conduit fittings, wire and cable, insulating materials, wiring devices, motors and control. For the heavy industries and utilities there were interesting displays of switchgear and other high-tension switching equipment. Of special interest was the display of the new small diameter building wires both of the rubber covered and synthetic types.

Honors for the success of this year's show go to James S. Patrick and the members of his Trade Show Committee; Charles A. Stone, Director of Publicity; and The Electrical Manufacturers Representatives Club of New England, headed by Stafford J. King with James H. Sullivan, vice-president; James V. Leary, treasurer, Charles D. White, secretary, J. S. Patrick, chairman Board of Directors.

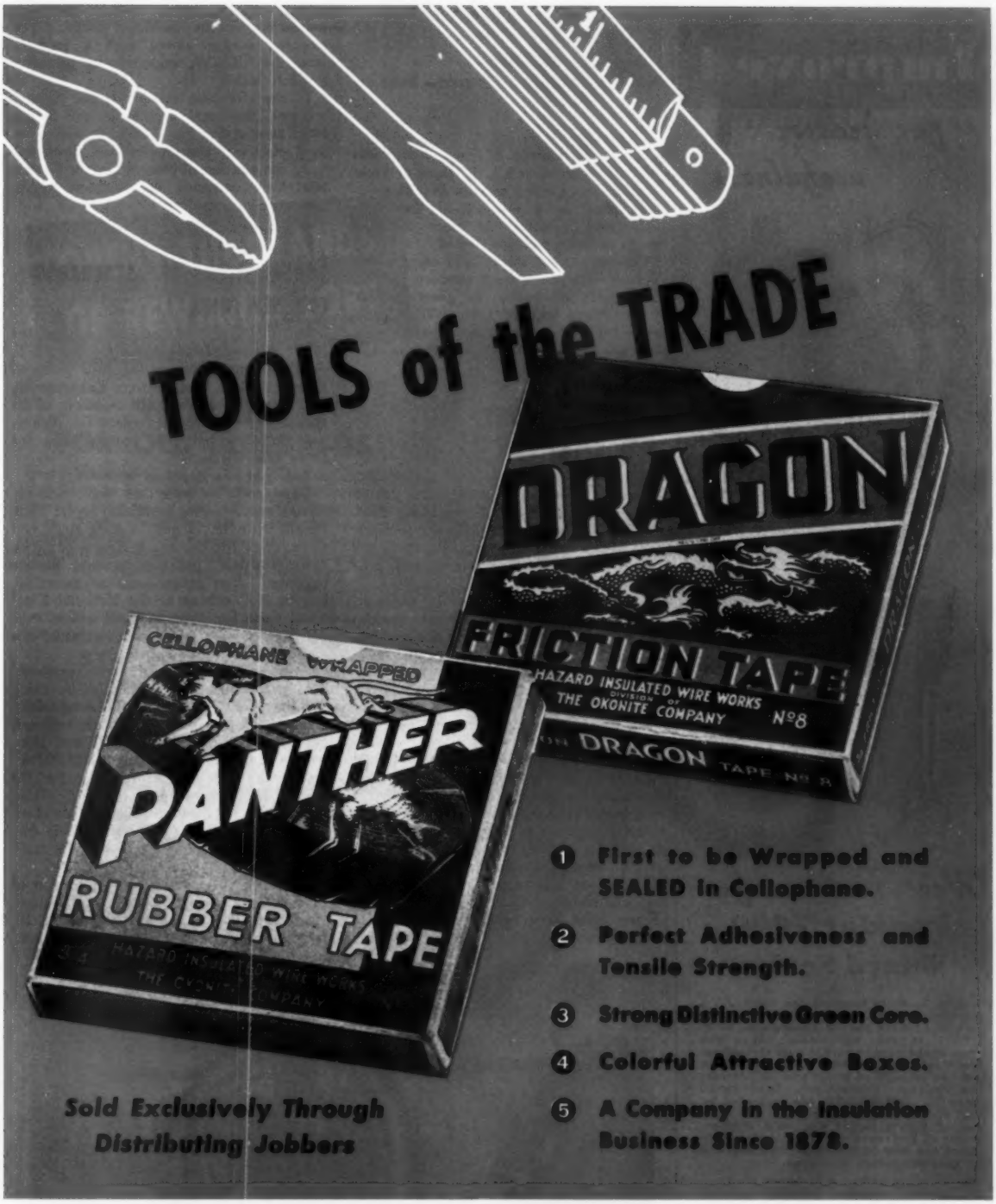
FLORIDA CONVENTION AT ORLANDO

The 17th Annual Convention of the Florida Association of Electrical Contractors & Dealers was held at the San Juan Hotel in Orlando, Florida, on Monday and Tuesday, April 1st and 2nd.

The Monday program included addresses by Laurence W. Davis, General Manager of NECA; Paul M. Geary, Representative of NECA Labor Relations Committee, and J. H. Dyer, NECA Field Representative. A. Penn Denton, Consulting Engineer for the Rigid Steel Conduit Association, discussed 1940 Code changes as they affect wire and cable installations in rigid conduit; and C. R. Long, of the Westinghouse Lamp Division, presented an effective story and demonstration on the developments of fluorescent lighting.

At the Tuesday morning session the speakers included R. B. Roberts of the Florida Power and Light Company; R. G Ewell, representative of the EHFA; C. A. Britton, representative of the Apprentice Training Division of the U. S. Department of Labor; and Joseph Whitner, representative of the Southeastern Underwriters Association.

CANDID SHOTS AT BOSTON SHOW—(1.) Steel & Tubes, Inc., representatives M. B. Steele, George E. Garland, M. W. Heron and H. Sanford. (2.) At the Square D Booth, R. A. Tibbetts, Square D; W. F. Fitzmaurice, Ed Abely, Will Hughes, Watertown; Jack Reddington, C. D. Paine, Springfield—all contractors and Albert Francis, Square D Co. (3.) The Burndy Mfg. Co. group, J. J. Costello, E. F. Hubert, Boston; Bern Dibner, Ted Gravenson, Roger Morrison, New York, and Ned Willis, Boston. (4.) J. J. Reddington, Master Electricians Assoc., Boston. (5.) At the G.E. exhibit, O. H. Van Amberg, G.E. Co., John E. Smith, contractor, Lincoln, Mass., John E. Newman, G.E. Co.; Thomas Coan, electrician, Lincoln, Mass. (6.) J. Eric Atkinson, S. H. Couch Co., Inc., Boston. (7.) Benjamin exhibitor and show chairman James S. Patrick, with W. R. Burnham, Westinghouse Elec. Supply Co., Worcester, and R. R. Burnham, consulting engineer, Boston. (8.) National Electric Products Co., exhibitors H. A. Pink, George D. Gibb, John MacDonald and Robert R. Ringer. (9.) Charles A. Stone, show publicity director. (10.) The U. S. Rubber group H. J. MacDonald, Fred A. Pinkerton, E. F. Brownworth, W. B. Mueller, Carl Short (standing) and N. R. French. (11.) Westinghouse representative E. C. Kemp explains transformer design to R. E. Davis, John M. Turnbull, engineer and R. N. Conly of Springfield. (12.) Showmen James H. McMullen, Boston, and James M. Bennan, Bellwood, Ill., Jefferson Electric Company.



HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Dallas Washington Cleveland

Pittsburgh Buffalo Boston Detroit Seattle San Francisco St. Louis Los Angeles

Improved

for greater usefulness

Watertight Socket fits snugly on side of lamp.
Concave Wire Outlet with pliable rubber opening that grips wires tightly and effectively seals end of handle.

New Features for

Popular 7000 Guard Series

Guards in every sense of the word . . . the new McGILL 7000 Series protects not only light bulb but all connections to it. Note in the illustration above the Watertight rubber socket and the rubber seal in the handle end . . . both of which prevent seepage of water and moisture to the interior. Connections, light bulbs, users . . . all THREE are protected by this new McGILL construction, every detail of which passes the rigid requirements of Underwriters' Laboratories. This guard can also be furnished with McGILL composition socket if desired.

There's a size and type for every need . . . in industrial plants, garages, railroad work, etc. Write for complete details.

McGILL MANUFACTURING CO.
Box No. 670
VALPARAISO, INDIANA

Electrical Division

McGILL

In the News

[FROM PAGE 76]

W. O. Henderson of Jacksonville was elected President, and L. L. Hunt of Jacksonville, was elected to take Mr. Henderson's place as a member of the State Executive Committee. All other officers of the Association were re-elected.

The convention was closed on Tuesday evening with the annual banquet and entertainment, at which the guest speaker of the evening was Dr. George W. Allison, of the Edison Electric Institute, whose subject was "The Good Will Value of Co-operative Promotion."

CONTRACTORS MEET IN STOCKTON

The Electrical Contractors' Association of Northern California held its annual meeting on April 20 at Stockton, Calif. The program was divided into two sections, one on industry affairs and education, the other on association problems and procedure.

Walter Heston, industrial engineer, Pacific Coast Electrical Bureau, demonstrated his testing "gadget" at the meeting. Its usefulness in demonstrating to building owners and managers the effect of voltage drop caused by inadequate wiring, illustrated to contractors how this tool can be used further in developing rewiring business.

This was followed by a discussion of the changes in the National Electrical Code permitting the use of small diameter wires in old raceways. Ralph W. Wiley, chief of the department of electricity, San Francisco, and a member of the Electrical Committee, discussed this. Allan Miller, Registrar of contractors for the State, reviewed recent cases in which contractors' licenses have been revoked for violations of the law designed to protect both the industry and the building public. The morning session closed with a message from the I.B.E.W., regional vice president J. Scott Milne.

In the afternoon session, closed to contractors, the legal aspects of the indictment against the San Francisco and Oakland electrical contractors was discussed.

At the election of officers Grover Grider, electrical contractor of Stockton, Calif., was named president.

UNDERWRITERS SET STANDARDS FOR NEW WIRE

In anticipation of the inclusion of the four new types of wires (types RHT, RPT, RU and SN) in the 1940 National Electrical Code, Underwriters' Laboratories, Inc., in collaboration with members of its Industry Advisory Conference for Wires, has prepared tentative requirements for these new wires.

The four new types of wire are:

Type RHT—Conductors with heat-resistant grade rubber insulation 32-in. thick for the Nos. 10, 12 and 14 Awg sizes, and 64-in. thick for the No. 8 Awg size; with flame-retardant, moisture-resistant fibrous covering. For general use as permitted by the 1937 edition of the National Electrical Code for Type R. Code grade, rubber-covered wire, but at a temperature not higher than 75 C.

Type RPT—Conductors with performance grade rubber insulation 32-in. thick for the Nos. 10, 12 and 14 Awg sizes, with flame-retardant, moisture-resistant fibrous covering. Mechanically and electrically equivalent to Type R rubber-covered wire. For use in rewiring for increased load where space is not available in raceways for conductors having standard insulation thickness, and where it is impracticable to increase the size of the raceways because of structural conditions.

Type RU—Conductors with insulation of 90 per cent unmilled grainless rubber (latex) 0.018-in. thick for the Nos. 10, 12 and 14 Awg sizes, with flame-retardant,

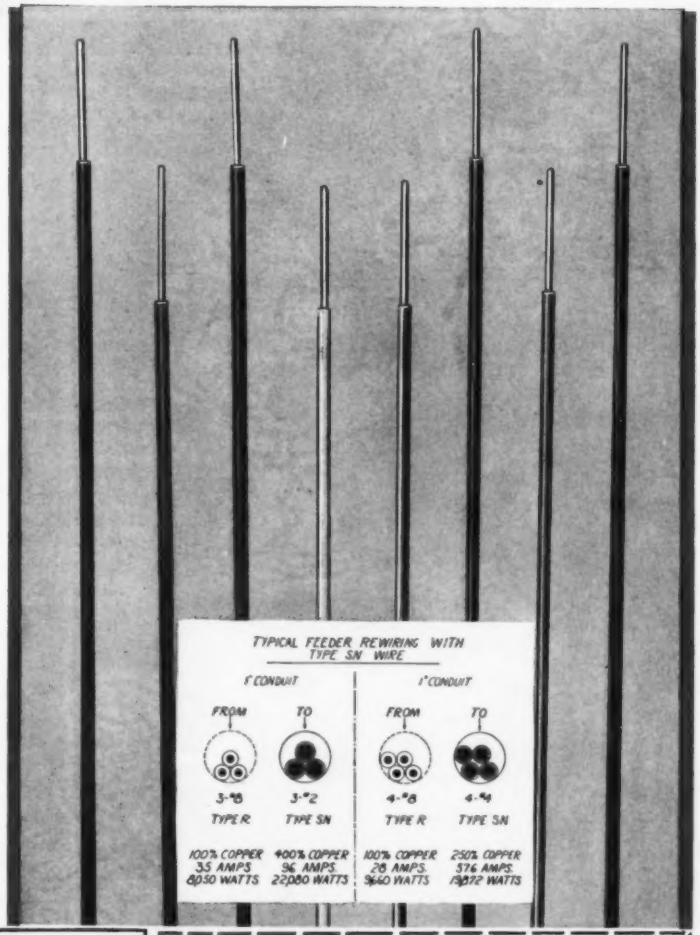
GROUP AT ORLANDO MEETING (Left to right back row) J. H. Dyer, NECA; Dr. Allison, EEI; C. R. Long, Westinghouse Lamp Works; O. V. Scott, Retiring President; Art Schanuel, (Seated) Dick Roberts, Sales Manager, Florida Power & Light Co.; F. J. McGinnis, Secy; R. G. Ewell, EHFA; A. Penn Denton, Consulting Engineer, New York City.

UMI

FLAMENOL BUILDING WIRE

SMALL DIAMETER FOR REWIRING EXISTING RACEWAYS

OPENS THOUSANDS OF REWIRING JOBS



NEW LIFE FOR OLD BUILDINGS

Every contractor knows of dozens of existing buildings in his community that would have been rewired long ago if the cost hadn't been prohibitive. Now these buildings can be rewired inexpensively. New raceways are not required. Just pull the present wires out of existing raceways and replace them with the new small diameter Flamenol Building Wires. Effective copper area can be increased as much as 400 per cent. Think of the rewiring jobs that are waiting for you!

SYNTHETIC COMPOUND INSULATION

Flamenol Building Wire Type SN is available in sizes 14 to 4/0 inclusive, for use in wiring existing raceways. It is insulated with a plasticized polyvinyl chloride compound. This insulation is tough, long aging and flame retarding. It resists oil, acids, alkalies and moisture. It serves both as an insulation and as a finish.

SMALL DIAMETERS

The reduction in diameter size permits the installation of more wires or wires of larger capacity in existing raceways (pending 1940 Code). See table below for comparative overall diameters. A variety of bright permanent colors make circuit tracing easy. Color goes all through the insulation and can easily be determined by cleaning or scraping if the wire becomes soiled. A hard glossy wax surface makes wire pulling easy.

MAIL THE COUPON

For samples of Flamenol Building Wire see the nearest G-E Merchandise Distributor or mail the coupon.

COMPARISON OF DIAMETERS

Size AWG	Approximate Overall Diameter (In.) Rubber Covered Types R, RP, RH	Approximate Overall Diameter (In.) Flamenol Type SN	Size AWG	Approximate Overall Diameter (In.) Rubber Covered Types R, RP, RH	Approximate Overall Diameter (In.) Flamenol Type SN
14 Sol.	.19	.130	1 Strd.	.56	.496
12 Sol.	.21	.147	1/0 Strd.	.60	.537
10 Sol.	.23	.168	2/0 Strd.	.65	.583
8 Strd.	.32	.246	3/0 Strd.	.70	.634
6 Strd.	.40	.314	4/0 Strd.	.76	.692
4 Strd.	.45	.363		up to 2,000,000 CM	
2 Strd.	.51	.423			

General Electric Company, Section WF-0125
Appliance and Merchandise Department
Bridgeport, Connecticut

Sirs: Please send me samples of Flamenol Building Wire.

Name.....

Address.....

City.....State.....

GENERAL ELECTRIC

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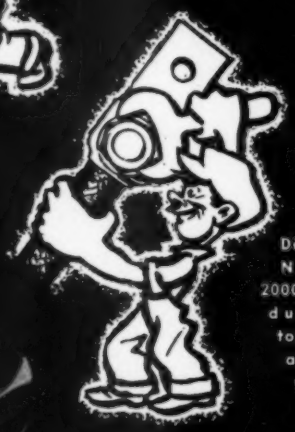
ELIMINATE GUESSWORK

The BURNDY Way

Where "trick" installations confound the estimator, let Burndy Qiklugs replace the question marks. Cost is uniform.

No equipment to carry, no roaring torch, just a wrench — the wrist does the rest. Job times stay constant.



Did you say range? No. 14 solid to 2000MCM with conductor angle, tongue dimensions and drilling up to you. Qiklugs cover all lug requirements.

BURNDY Qiklug

SEE YOUR WHOLESALER ON THIS ITEM

BURNDY ENGINEERING CO., INC., 459 E. 133RD ST., NEW YORK

In the News

[FROM PAGE 78]

moisture-resistant fibrous covering. Mechanically and electrically equivalent to Type R rubber-covered wire. For use in rewiring for increased load where space is not available in raceways for conductors having standard insulation thickness, and where it is impracticable to increase the size of the raceways because of structural conditions. Maximum operating temperature, 60 C. Maximum potential, 600-volts.

Type SN—Conductors with approved flame-retardant, moisture-resistant, solid-synthetic insulation without fibrous covering. Recognized in 14 to 0000 Awg incl. with minimum insulation thickness as follows:

14–10	8	6–2	1–0000
1/32	3/64	1/16	5/64

For use in rewiring for increased load, where space is not available in raceways for conductors having standard insulation thickness, and where it is impracticable to increase the size of the raceway because of structural conditions. Maximum operating temperature, 60 C. Maximum potential, 600-volts. This type of wire not to be installed at a temperature lower than 0 C.

When these proposed requirements are adopted a date will be set at which time they will become effective. All wires submitted to the Laboratories on or before that date will be investigated at the same time and all wires of the same type found, on the first investigation, to be acceptable, will be listed simultaneously.

NEW YORK UNION AND CONTRACTORS INDICTED

Local No. 3, IBEW, an AFL affiliate, twelve of its officers and representatives, five contractors' associations and six of their present or former officers were indicted by a Federal Grand Jury on charges of conspiring to violate the Sherman anti-trust act.

The charge was embodied in four indictments and obtained by Thurman Arnold's associates in their nation-wide campaign to stamp out what they consider illegal restraints in the building and construction industry.

DETROIT CONTRACTORS INDICTED

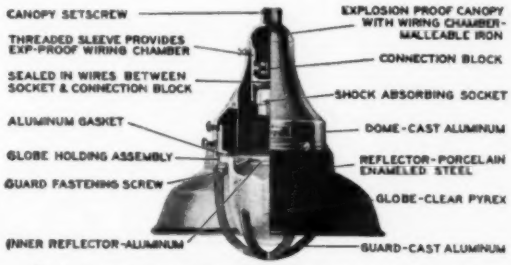
Detroit contractors provided more victims for the Thurman Arnold building industry prosecution which has shown a vigorous interest in electrical work out of all proportion to its share in the building industry.

The Detroit Electrical Contractors Asso-

Appleton Products

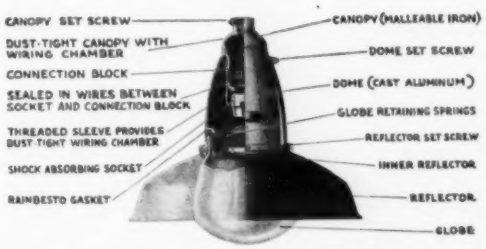
. . . THE RESULT OF CONSTANT IMPROVEMENT . . .
TIRELESS RESEARCH . . . ENDLESS DEVELOPMENT

THE LATEST *Explosion-Proof* LIGHTING FIXTURES
("EV" SERIES)



Safeguard hazardous locations with Appleton's Explosion-Proof Lighting Fixtures. Relamping easily accomplished by loosening thumb screw and removing globe holding assembly.

THE LATEST *Dust-Tight* LIGHTING FIXTURES
("DTL" SERIES)



Avoid needless risks! Install Appleton's Dust-Tight Lighting Fixtures . . . with socket and lamp completely isolated by sealing neck and threaded dust seal. Exterior streamlined design further prevents dust accumulation.

Use Appleton's Explosion-Proof and Dust-Tight Lighting Fixtures . . . sectionalized for quick and easy installation. Their modern construction includes every new Appleton feature of safety and stability, compactness and simplicity. No complicated mechanisms, no more turning and loosening in service, no more bother about removing the whole fixture for relamping. Shock-absorbing sockets are standard equipment. Many other important improvements and developments make these Explosion-Proof and Dust-Tight Lighting Fixtures outstanding examples of Appleton's continuous forward-march in the field of electrical products.

SOLD THROUGH WHOLESALERS

COMPLETE CATALOGUES AND BULLETINS SENT UPON REQUEST

APPLETON ELECTRIC COMPANY

1704 WELLINGTON AVENUE CHICAGO, ILLINOIS

Branch Offices: NEW YORK, 75 Ninth Avenue · DETROIT, 2310 Woodward Avenue · CLEVELAND, 214 Hippodrome Bldg. · SAN FRANCISCO, 655 Minna Street · ST. LOUIS, 420 Frisco Bldg. LOS ANGELES, 100 North Santa Fe Avenue · ATLANTA, 203 Luckie Street, N. W.

Resident Representatives: Baltimore, Birmingham, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, Minneapolis, New Haven, Philadelphia, Pittsburgh, Seattle

Figure the Economies

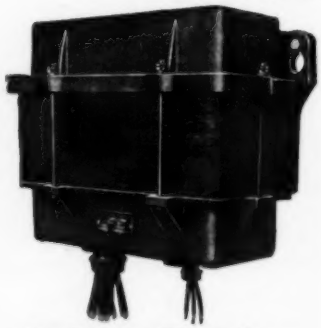
of AmerTran Type "CF" Transformers in Industrial Plants

1. Obtain 115/230 volts at lower Power Rates.
2. Low initial investment.
3. Easy to install.
4. Minimum Maintenance Expense.
5. Efficient in Operation.

THERE is no necessity for oil, fireproof vaults, enclosures and similar inconveniences when you use AmerTran Type CF Transformers to change your voltage. These efficient units are moderately priced, and, because they are air-insulated and self-cooled, may be installed wherever needed—either indoors or outdoors—without restrictions.

AmerTran Type CF general-purpose, out-door-type, air-cooled, single-phase transformer. Standard sizes to 15 Kva., 60 cycles.*

THEY may be used in industrial plants to supply power at changed voltage (600 V. or less) to all manner of small and medium loads, such as lighting, heating devices, small motors, and portable tools. Each transformer is a complete operating unit, requiring no extras and capable of supplying its full rated output continuously with a minimum of maintenance. All sizes are equipped with lugs for wall mounting and conduit fittings for connections, so as to facilitate installation, and both single and polyphase designs are furnished as a single unit. Let us send data on equipment to meet your needs. Ask for bulletin No. 1116A.



AmerTran Type CFT transformers are three-phase units with similar characteristics and features to Type CF described above.

**Similar equipment for indoor service only available in standard sizes up to 150 Kva.*

AMERTRAN

Manufactured Since 1901 at Newark, N. J.

AMERICAN TRANSFORMER CO.

178 EMMET ST. NEWARK, N. J.

In the News

[FROM PAGE 80]

ciation, 10 individual Detroit firms and Local 58 of the A. F. of L. International Brotherhood of Electrical Workers and two of its business agents Lloyd J. Cooms and Frank Caccia were named in an indictment by a special grand jury charging conspiracy to form a combination in restraint of trade in violation of the Sherman Act.

These indictments are based upon the statements of witnesses and investigators to the grand jury in the interests of the prosecution and are not necessarily founded on actual facts.

WEST COAST BUREAU CHECKS WIRING

The northern division of the Pacific Coast Electrical Bureau, San Francisco, Calif., has solved its problem of finding an effective means to demonstrate the effects of inadequate wiring. It all evolved from the Bureau's endeavor to develop the tremendous potential market offered by wiring modernization.

Walter C. Heston, industrial engineer for the Bureau, designed and built a 40-pound demonstration kit consisting of a

WALTER C. HESTON, industrial engineer for the PCEB, northern division, demonstrates the kit he designed to dramatize the need for adequate wiring.

compact arrangement of a variable tap auto-transformer, meter and load receptacles and toggle switches for applying load and demonstrating voltage drop.

The kit can be taken to a building and connected to the existing lighting system to make a check-up. If necessary, the voltage can be boosted to normal lamp rating by means of the auto-transformer and the customer can actually see the difference in lighting due to the voltage boost.

Once the tests are made the Bureau sends the customer a written report with its recommendations.

NEW OPPORTUNITY FOR ELECTRICAL CONTRACTORS WITH HYGRADE MIRALUMES

CASH IN ON THE TREMENDOUS DEMAND FOR NATIONALLY-ADVERTISED, SENSATIONAL, COMPLETE "PACKAGES" OF FLUORESCENT—HYGRADE MIRALUMES!

NOTE—Extraordinary lighting efficiencies are obtained in fluorescent lamps by tuning the electric discharge to concentrate its ultra-violet energy at the precise 2537 Angstrom Unit wavelength most effective in causing the porous film (Hygrade Patent 2,096,693) to generate light. This achievement, so important to the efficiency of HYGRADE MIRALUME, is described in Patent No. 2,126,787, now controlled in this field by HYGRADE.

TODAY there's a wonderful new opportunity for any Electrical Contractor—in all commercial and industrial fields—with HYGRADE MIRALUMES!

These amazing, complete "packages" of daylight give several times more light per watt—without harsh glare or shadow—with 75% less radiant heat, for equal light-intensity.

HYGRADE MIRALUMES are priced right to you, and they actually sell themselves! Find out about new free-trial and F.H.A. financing. Act now to cash in on this greatest development in lighting today!

MIRALUME INSTALLATION increased illumination from 18 to 40 foot-candles in Unity Motor Sales Corp., N. Y. C.

COMMERCIAL OR INDUSTRIAL—HF-200 MIRALUME: 200 watts; 4 40-watt tubes; approx. length, 50"

SHOWN HERE are two of many MIRALUMES ready now—as this goes to press. They are designed, engineered, built and guaranteed by HYGRADE. Supplied wired—ready-to-install—or unwired.

Every MIRALUME is corrected for power factor and stroboscopic effect. Starters are easily accessible.

Get full information from your local Hygrade jobber—or use coupon below. Thousands are being installed each week.

Fluorescent at its Finest—

Hygrade Miralumes

Hygrade Sylvania Corp., Est. 1901. Makers of Hygrade Incandescent Lamps and Sylvania Radio Tubes

CLIP AND MAIL TODAY

HYGRADE SYLVANIA CORPORATION
SALEM, MASS.

I am interested in Hygrade Fluorescent Miralume Units . . . prices, discounts, full information.

COMPANY_____

INDIVIDUAL_____

ADDRESS_____

EC-5

CITY AND STATE_____

Copr. 1940 Hygrade Sylvania Corp

★ **TOO LATE** for the door opener again. A simple thing to correct, but it happens every day, over and over again, to the embarrassment and annoyance of apartment dwellers and their callers.

Connecticut engineers found the answer — a suite telephone with a pilot light that shows the tenant instantly when the vestibule door has been opened. . . . another example of alert, progressive engineering.

Connectaphone with pilot light shows apartment dweller when caller opens vestibule door.

To assist owners, contractors, architects and engineers in planning communications and signaling systems, Connecticut engineers offer you, at no cost, a comolete service from preliminary consultation to detailed installation and wiring diagrams.

For advanced engineering put it up to Connecticut

CONNECTICUT
Telephone and Electric
CORPORATION
Meriden, Conn.

In the News

[FROM PAGE 82]

USHA PROJECT WIRING CUT

One of the problems facing the USHA is how to hold down wiring costs while meeting every possible subsistence demand by low income tenants.

A. C. Bredahl, USHA chief engineer, says the cost of wiring runs around $150 per dwelling unit, or approximately $37 per room. And with 160,000 projects under construction throughout the country, this will total $24,000,000.

The Authority has had some difficulty in meeting requirements of the Electrical Code, particularly Rule 2110 requiring one receptacle, or outlet, for every 10 feet of wall space.

Due to the fact that size of rooms in most housing projects are no larger than 10- by 10-feet, USHA has recommended to local housing authorities that no more than two receptacles be used. One is an ordinary wall plug, while the other is a combination receptacle and pull chain wall light, designed by the USHA, to be used in place of a ceiling light.

NEW ADEQUATE WIRING CLUB

For the study of fundamentals of interior wiring design and modern wiring practices, a group of Kansas City electrical contractors have formed an Adequate Wiring Club, open to local members of the industry who are willing to attend regularly and take cooperative part in the work. Art Smiley of A. E. Smiley & Co., electrical contractors, is president and Charles V. Dunn, technical advisor of Kansas City Power & Light Co. is secretary. Meetings are held weekly and 35 members are actively cooperating. Problems of feeder design, voltage loss, branch circuit and lighting lay-out are presented for study.

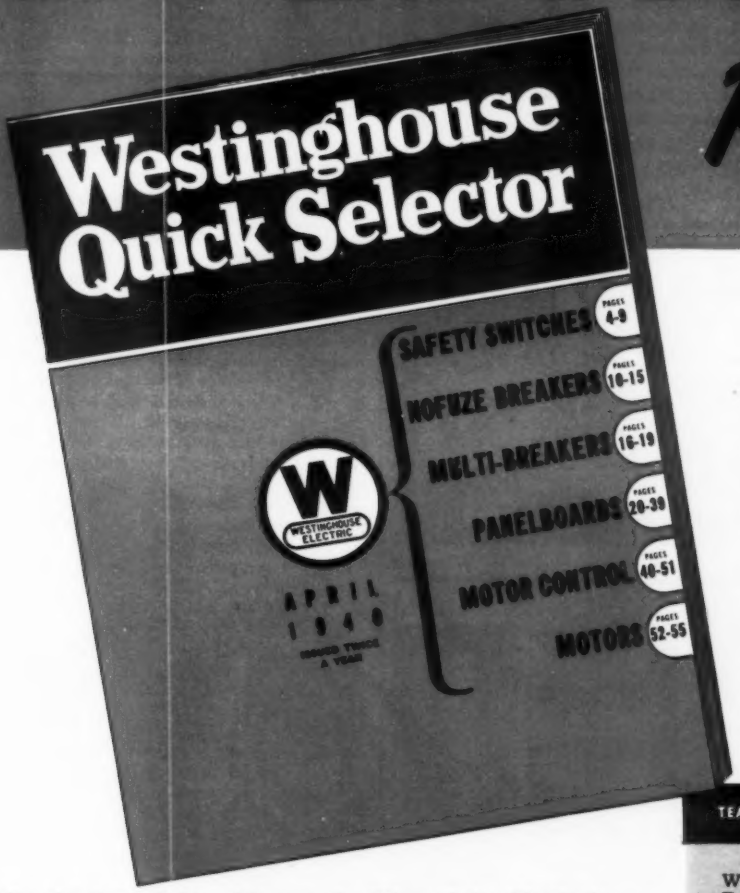
CHECK-METER FOR HOUSING

To solve the problem of keeping energy costs within the budgets of the low cost housing tenants, the United States Housing Authority is recommending, to local housing authorities, the use of a color dial meter to be mounted in the kitchen of each apartment.

This meter is designed to give the tenant control over his consumption of electrical energy, similar to that afforded by the cyclometer type meters now used in REA work. It has a dial calibrated in zones, set off by four different colors and is re-settable after reading. One zone of the dial circumference is green, representing the current allowed the tenant as part of his rent. When the pointer passes on to the next color zone the tenant has used

2nd EDITION

READY NOW



THE TIMESAVER FOR EVERYONE WHO SELECTS PRICES AND SPECIFIES ELECTRICAL EQUIPMENT

Like the first edition, this second edition of the Westinghouse Quick Selector is going fast. Contractors, wholesalers, and factory executives who received the first edition know how helpful this book can be. Their requests for it are pouring in fast.

The Quick Selector's 60 pages contain: Prices—complete and tabulated; explanations of apparatus operation and use; latest features; most frequently used electrical data; wiring diagrams. If you missed the first edition—don't miss this one. Send for your copy today.

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Every item in line of Ward Leonard Controls is an outstanding product of sound engineering, practical designing and careful manufacture . . . each planned to meet a specific set of conditions in industry. The absolute dependability and ruggedness of Ward Leonard Controls make them ideal controls to be built into machines and equipment the maintenance of which is expensive or difficult.

Bulletins available describing

RELAYS VOLTAGE REGULATORS CONTACTORS
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Electrical Control Devices Since 1892

Send for bulletin of interest

Badger

Synchronous

ELECTRIC TIME SWITCHES

CONTRACTORS LIKE THEM BECAUSE:

they are dependable and easy to install

USERS LIKE THEM BECAUSE:

of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY

1937 MEAD STREET RACINE, WISCONSIN

In the News

[FROM PAGE 84]

excess current for which he will be charged an additional amount and so on with the other two zones.

A. C. Bredhal, USHA chief engineer, hopes this meter will: (1) Avoid submetering which the utilities oppose, and (2) Avoid surprising the tenant with unwelcome extra charges on the rent bill.

Anti-Trust Tactics

THE ANTI-TRUST DRIVE against the building trades unions is assuming a new aspect as A.F.L.'s angry defiance cools. Union bigwigs now are sitting down with Assistant Attorney-General Arnold, learning that the same terms governing future conduct are available to the unions as to business concerns:

(1) Parties against whom no antitrust action is pending can avoid criminal prosecution by making full disclosure to the Department of Justice of present or projected activities which restrain trade in a fashion they consider reasonable. If the Department finds that such activity violates the law, the party so advised will proceed at its own peril. If the Department is unable at the time to state positively that the plan is legal or illegal and the party decides to go ahead, any future action by the Department will be made through civil proceedings. This policy was pursued in the pending railroad and movie cases.

(2) Parties against whom a criminal action is pending (which includes all the union cases) may offer, either before or after indictment, a civil decree which will be accepted for submission to the court if its terms, in the Department's opinion, are an adequate remedy for conditions attacked in the criminal proceeding. Example of this policy, as applied to unions, would be a settlement by civil decree which not merely terminates a jurisdictional dispute but binds the unions to accept compulsory arbitration of any future disputes between them in pain of being held in contempt of court.

Not yet publicized: A new feature of Arnold's antitrust policy is his decision to tighten up in criminal cases which terminate in civil decrees. Instead of a *nolle prosequi* in such cases, Arnold will insist that defendants enter a plea of *nolo contendere* as prerequisite to entry of a civil decree. (*Reprinted from* BUSINESS WEEK.)

ST. LOUIS STAGES ELECTRICAL SHOW

The St. Louis Electrical Board of Trade held an exhibit of progress of electrical equipment at the St. Louis Auditorium April 2 to April 4 attracting over 5000 visitors from the electrical industry in Missouri and surrounding states. Arrangements were in charge of Carl Christine, secretary of the Electrical Board of Trade.

LEVITON

"1030" Line of Toggle Switches

popular priced—quality line
Single Pole No. 1030 rated 10A—125V.
Three way No. 1031 rated 10A—125V.

Bakelite case and toggle—dustproof—strong assembly. Brown or Ivory

"250" Line of Toggle Switches

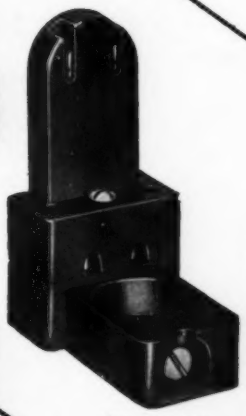
High grade
Single Pole No. 250 rated 10A—125V.
Three way—No. 251 rated 10A—125V.
Four way No. 252 rated 5A—125V.
Double Pole No. 256 rated 10A—250V.

All Bakelite—completely dustproof. With special pad to fit wall plate for better alignment. Brown or Ivory

These new devices are typical of the LEVITON line which includes a large variety of wiring devices for residential, commercial and industrial work. Ask your local wholesaler to show you these products.

If your wholesaler does not carry the item you need, we will be glad to send you a sample.

Cat. No. 379

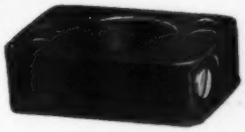


Cat. No. 381

No. 8815—Porcelain Pull Chain Ceiling receptacle.

One piece porcelain—no ring
Built in mechanism—open wiring

All types of Fluorescent fixture devices—push in type—sturdy construction and easily mounted. Can be mounted with either 2 screws or with 1 screw as shown.



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WRITE FOR CATALOG

LEVITON MANUFACTURING CO.
236 GREENPOINT AVE., BROOKLYN, N. Y.
111 N. Canal St., Chicago, Ill. 420 S. San Pedro St., Los Angeles, Calif.

Positive Protection with

"EVER-LOK"

PLUGS • RECEPTACLES AND CABLE CONNECTORS

From 10 to 200 amperes—440 volts

SIMPLE—SURE—ECONOMICAL

LOCKS AUTOMATICALLY

RUSSELL & STOLL CO., INC.

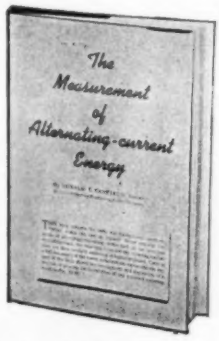
150 Park Place New York, N. Y.

A book for metermen—
telling how to measure
with the induction watt-hour meter

This practical book answers for metermen the following questions:

1. What makes the disk in the meter go around?
2. How can this revolving disk be made to measure energy?
3. What metering scheme should one use to measure the energy in a particular circuit?
4. How may one be sure that all the energy in such a circuit is metered by the particular scheme chosen?

The presentation is based throughout on the author's wide experience with classes of metermen.



Measurement of Alternating Current Energy

By DONALD T. CANFIELD

Associate Professor of Electrical Engineering, Purdue University

210 *pages*, 5½x8, 74 *illustrations*, $2.00

THE book begins with an outline of the development of the principles of metering. It then provides an answer to the question: What are the ways and means, together with their modifications, of producing a torque on a rotatable member by electromagnetic means?

After showing the possibilities of producing rotation in a disk by electromagnetic means, it explains why such motion must have a purpose.

Only a personal examination of this important book can reveal its value to you. Send this coupon TODAY.

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330 West 42nd Street, New York City

Send me Canfield's Measurement of Alternating Current Energy for 10 days' examination on approval. In 10 days I will send $2.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

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In the News

[FROM PAGE 86]

There were 101 booths occupied by manufacturers and dealers in electrical equipment, qualifying the St. Louis show as among the largest in the country.

The Electrical Board of Trade show is regularly held every two years in St. Louis.

COMING MEETINGS

National Electrical Manufacturers Association—Spring meeting, The Homestead, Hot Springs, Va., May 12–17.

National Electrical Wholesalers Association—Annual Convention, The Homestead, Hot Springs, Va., May 19–23.

New York State Association of Electrical Contractors and Dealers—Annual Convention, Lake Placid Club, Lake Placid, N. Y., June 17–20.

International Association of Electrical Inspectors—Southwestern Section, Santa Barbara, Calif., August 26–30. Northwestern Section, Great Falls, Mont., Sept. 3–6. Southern Section, Houston, Texas, Sept. 16–20. Western Section, Kansas City, Mo., Sept. 23–27; Eastern Section, New York, N. Y., Oct. 7–11.

National Electrical Contractors Assn.—Annual Convention, George Washington Hotel, Jacksonville, Fla., Oct. 21–23.

National Electrical Manufacturers Assn.—Annual Conference, Waldorf-Astoria Hotel, New York, N. Y., Oct. 27 to Nov. 1.

BOOK REVIEWS

Practical Electricity

This is a revised edition of Croft's Practical Electricity, brought up to date and incorporating all the latest developments in theory and practical applications of the various fields of electricity.

The text is divided into 54 sections covering the subject of electricity from the electron theory through the fundamental conception of electricity, its generation, transmission, application. The theory and application of the various components of electrical circuits; motors and generators, batteries, magnets, magnetism and electronic tubes are a few of the subjects treated.

This book is written in a straightforward, easily understood manner for study by any person desiring a working knowledge of electricity. Simple enough for the beginner and complete enough for the graduate engineer to use as a handy reference. Practical Electricity, Fourth Edition. By Terrell Croft, consulting engineer. Revised by George H. Hall, M.E. Price $3.00. 701 pages. Cloth bound. McGraw-Hill Book Company, 330 W. 42nd St., New York City.

Interior Electric Wiring and Estimating

This book is a volume of practical detailed "how to do it" information on the design, installation and estimating of interior electric wiring for the residence, apartment building and industrial plant. The various types of wiring, material used and the tools necessary are clearly outlined.

Detailed chapter discussions cover knob and tube wiring; interior electric wiring with flexible steel conduit, armored cable and non-metallic sheathed cable; conduit wiring, materials, tools and methods; apartment building wiring; factory building wiring; estimating electric wiring. The appendix includes a set of eight detailed blueprints.

This book, compiled by a contractor, a utility man and an electrical engineering professor, is written in plain language and includes several special technical terms used by everyday work-

I'm a Contractor...

WHY TELL ME ABOUT A SUBMARINE CABLE?

HERE'S WHY — Because a submarine cable encounters the same conditions, in exaggerated degree, that tend to destroy wires and cables in building service. A submarine cable must withstand constant immersion in water and direct burial in earth and mud of all conditions of alkalinity or acidity. Its shore ends must withstand exposure to air and sunlight, in extremes of temperature.

Building wires, too, must be able to withstand water, earth, acids and alkalies, though not to the same degree as submarine cables.

That's why it's important to you to know that the world's first non-leaded submarine power cable, engineered and manufactured by American Steel and Wire Company, and laid in 1909, is still in perfect operating condition after 31 years of service. No other non-leaded submarine power cable can even approach this service record.

As an electrical contractor remarked when told about that cable: "When a company can produce cables for that kind of service, I know they won't have any difficulty in supplying me with A-1 wires for my building jobs." Write today for data.

ADEQUATE WIRING SERVES AND SAVES

TREE WIRE

PARKWAY CABLES

VARNISHED CAMBRIC CABLES

BUILDING WIRES

SERVICE ENTRANCE AND DROP CABLES

AMERCLAD CORDS & CABLES

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York

UNITED STATES STEEL

THERE ARE PROFITS IN AIR CONTROL!

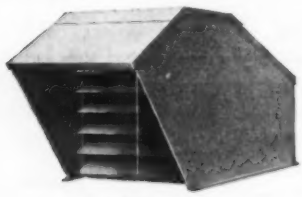
Stop Stale Air Losses in Factories, Offices and Stores with

REX AIRATE

COMFORT VENTILATION

MODEL SK—EXHAUST UNIT

Fresh air in motion cuts production costs for the manufacturer by eliminating worker fatigue and error caused by stale air. Air circulation helps the managers of stores and restaurants to increase sales by providing more desirable and healthful conditions for patrons.



ROOF MODEL

In the REX-AIRATE line are the widely adaptable SK models, the Roof Model, Floor Circulators, and Window Ventilators. REX-AIRATE features include:

Belt drive for quiet running
All-steel construction
Full range of sizes
Reliable capacity ratings

Another *fast-selling* REX-AIRATE unit is the "Attik-Pak"—a *complete package* attic ventilator for homes.

WRITE TODAY for the booklet "Comfort Ventilation" and for full details on our money-making line.

Air CONTROLS INC.

Div. of The Cleveland Heater Company
1935 West 114th St.,
Cleveland, Ohio

In the News

[FROM PAGE 88]

men. Contains numerous diagrams and sketches. Interior Electric Wiring and Estimating. By Albert Uhl, contractor, Arthur L. Nelson, member Western Society of Engineers, and Carl H. Dunlap, head of Elgctrical Engineering Department, American School. Price $2.50. 342 pages. Cloth bound. The American Technical Society, Drexel Ave. at 58th St., Chicago, Ill.

WITH THE Manufacturers

G-E Personnel Changes

Chester H. Lang, manager of General Electric's advertising and sales promotion activities since 1932, has been named manager of apparatus sales and vice chairman of the company's Apparatus Sales Committee. He is being succeeded as head of the advertising department by R. S. Peare, manager and president of Maqua Co.

Don J. Murray has been appointed sales manager for G-E conduit products, with headquarters at Bridgeport, Conn. He was formerly district representative for wiring materials at Los Angeles.

J. H. Newman has been appointed manager of district No. 1 of G-E wiring material sales section and will make his headquarters at Boston. He replaces E. G. Hall, who has been transferred to Los Angeles.

F. D. Crowther and H. E. Mahan have been named managers respectively, of the lighting sales section and the illuminating laboratory section of the G-E lighting division.

David C. Prince of Philadelphia, since 1931 chief engineer of the switch gear department, has been named manager of the commercial engineering department, succeeding the late Vice President E. W. Allen. He will make his headquarters in Schenectady.

Ray H. Luebbe, counsel of the appliance and merchandising department, has been named assistant general counsel of the Company. He will continue to make his headquarters in Bridgeport.

•

Graybar Appointments

Alfred H. Nicoll was recently elected vice president of the Graybar Electric Company in New York. Since last November, he has served as assistant to the president, and for the eight years previous to that as district manager of the company's San Francisco territory.

R. S. Robinson has been appointed manager of the company's branch office in Tampa, Fla.

L. M. Smith has been made sales manager of the Orlando, Fla., branch office.

The branch office in Worcester, Mass., moved to new headquarters at 165 Commercial St.

180 AMPERE

Heavy-Duty, Solenoid-Type

TIME SWITCH

★

For those heavy loads to be automatically time controlled each day, the Model 1290 AUTOMATIC Time Switch has two knife-blade poles with a capacity of 90 amperes each; 180 amperes on a split load!

A companion model is the Number 1250 with a capacity of 50 amperes on each of its two poles, or 100 amperes on a split load.

Write For Information and Discounts

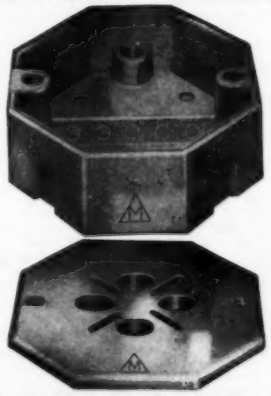
Automatic
Electric Manufacturing Co.
MANKATO, MINN.

Profit by USING

ILLINOIS

Dependable Porcelain

OUTLET BOXES

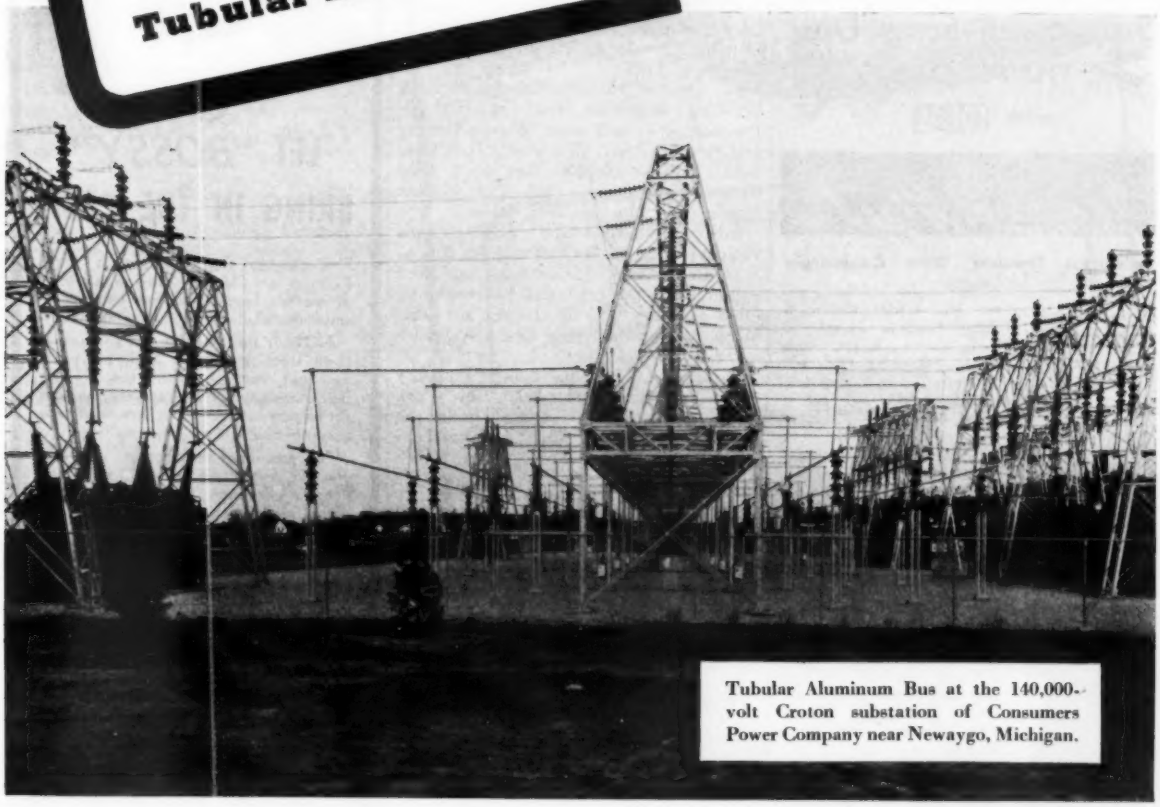


★ Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.

It simplifies construction— Tubular Aluminum Bus



Tubular Aluminum Bus at the 140,000-volt Croton substation of Consumers Power Company near Newaygo, Michigan.

Supports can be far apart, because tubular Alcoa Aluminum Bus is rigid. No unsightly sagging to spoil the appearance of your construction. Supports have less burden to carry, for this conductor is light in weight. Construction can be lighter throughout and less costly.

Alcoa Aluminum Buses offer a high degree of thermal and electrical efficiency. Corrosion is no problem; you'll find Aluminum Buses performing perfectly under the most adverse conditions.

Alcoa engineers will gladly advise you on the type and size of Aluminum Bus Bar best suited to your requirements; tubular, flats, angles or channels. Standard, inexpensive fittings are available. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.

Strip Wires—Screw On—
THAT'S ALL!
with IDEAL

Wire-Nuts

Solderless - Tapeless Wire Connectors

Tapered spring insert presses clean threads into wires—acts as a current-carrying sleeve—giving a pressure contact—better electrically and mechanically than solder and tape.

¼-inch molded composition is unaffected by heat, cold or moisture.

No waste—no bother—no hot solder or open flame hazards when you make wire joints with *Ideal* "Wire-Nuts". It's "duck-soup" to make connections that will get a quick "O.K." from Inspectors.

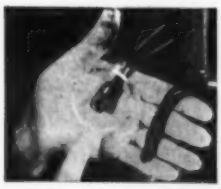
So strong is the *Ideal* "Wire-Nut" connection that it will withstand nearly 3½ times more pull that the best solder-and-tape joints, yet rewiring can easily be made by simply unscrewing the nut.

These handy Wire Connectors insure tightly compressed contact between wires. They are highly resistant to heat and are puncture-proof at 10,000 volts. Grounds, shorts and corrosion are eliminated.

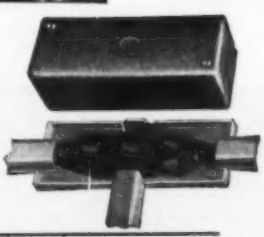
There's an *Ideal* "Wire-Nut" for every common wire joint in solid or stranded wire from 2 No. 18 to 3 No. 10.

Fully Approved: Listed by Underwriters' Laboratories, Inc.

COMPARE



MILLIONS IN USE FOR—
Hanging Fixtures
Roughing-In
Installing Appliances
Joining Wires in Conduit Boxes, Switchboxes, etc., etc.



Free Samples on request

Electrical Products Division

IDEAL COMMUTATOR DRESSER COMPANY

1041 Park Avenue Sycamore, Illinois

In the News

[FROM PAGE 90]

Airtemp Distributors

The Airtemp Division of Chrysler Corp. has appointed new distributors in Detroit, Cleveland, Pittsburgh, Dayton and New York.

In Detroit, Wholesale Lumber & Building Materials, Inc., at 7500 E. Davison Ave., will cover Wayne County and Southeastern Michigan. In Cleveland, Kinsner Supply Co., 1614 East 40th St., will cover the metropolitan district and Northeastern Ohio.

For Pittsburgh and Southwestern Pennsylvania, L. D. McCandless & Co., 5124 Penn Ave., Pittsburgh, has been appointed. Dayton and surrounding Ohio territory will be covered by Ohio Metal & Manufacturing Co., 818 Monument Ave., Dayton.

Airtemp oil heating equipment only will be sold in Metropolitan New York by the Central Coal Company, under the present distributor, Marr & Futoran.

•

Trico Fuse Mfg. Co., Milwaukee, announces the appointment of Huie-Simmer Co., 103 Thomas Bldg., Dallas, Tex., as district sales representatives in the state of Oklahoma.

L. W. Sloan, 408 Olive St., St. Louis, Mo. has been made district sales representative in St. Louis and vicinity.

•

Charles G. Pyle, sales manager of the Hygrade Lamp Division, **Hygrade Sylvania Corporation**, has moved from Chicago to the company's New York office, 500 Fifth Avenue.

•

Yale & Towne Manufacturing Company announces the promotion of James C. Morgan from general sales manager of the Philadelphia Division to general manager of the entire Philadelphia plant.

•

Reliance Electric & Engineering Co., Cleveland, elected James W. Corey as sales vice-president, at its recent directors' meeting. He has been general sales manager of this company since 1932.

•

National Store Fronts, Boston, announces the appointment of Edward I. Felkoff, of Bronx, New York, as its factory representative.

•

Coffing Hoist Company, Danville, Ill., has appointed Harry N. Hayes as general sales manager. He has been with this company for a number of years as district sales manager in various territories.

LET *"BOSSY"*
BRING IN THE CASH

The electric fence season is here! Farmers are already buying supplies of electric fence insulators and accessories for their electric fencing needs.

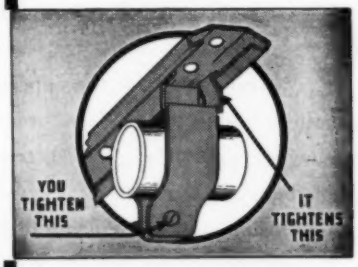
NOW is the time for you to contact your rural customers and prospects and get your share of the electric fence business. There are volume and profit possibilities in this line—get your share of the volume now available!

For customer satisfaction, insist on electric fence accessories made by Porcelain Products, Inc. Write for complete information and prices today.

PORCELAIN PRODUCTS, INC.
FINDLAY, OHIO

With Only One Screw to Tighten . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker Easier Installation

•

"CONVINCE YOURSELF"

"Send for Circular Giving Full Details"

•

THE CLEVELAND SWITCHBOARD CO.
2927 E. 79 St. Cleveland, Ohio

The Beamlite Electric Corporation, with offices at 366 Madison Avenue, New York City, has just been formed. It has taken over the business of B. E. Sales Corporation, one-time operators of Birdseye Electric Company and will produce and distribute a complete line of reflector and general lighting service incandescent lamps under the brand name of "Beamlite." W. R. Freeman, former general sales manager of the Birdseye Company is general manager of the new company.

In addition to the New York City offices, Beamlite Electric will operate a branch at 600 South Michigan Blvd., Chicago.

•

The Simplex Wire & Cable Company, Cambridge, Mass., at its recent annual meeting, elected Henry A. Morss, Jr. as a vice-president.

•

Brown Company, Berlin, N. H., has moved its New York office from 420 Lexington Avenue to 500 Fifth Avenue.

•

Standard Transformer Company, Warren, Ohio, has just made H. H. Knowles its sales representative for the state of Alabama. His headquarters are at 418 Watts Building, Birmingham, Ala.

•

Cutler-Hammer, Inc., has put E. F. Meyer in charge of the Houston territory, with headquarters in that city.

•

The Wiremold Company, Hartford, Conn. has started work on a new 27,000 square foot plant unit.

•

Century Electric Company has moved its Chicago district office to the Igoe Building, 600 W. Van Buren Street.

More Gossip

Canadian Contractors Protest

The electrical contractors section of the St. John, N. B. branch of the Canadian Construction Association has submitted a formal protest to the St. John City Council.

They protest against the laxity of electrical inspections and the granting of electricians' licenses to incompetent applicants. Members of this section also have refused to submit bids for the electrical work in a remodeled building to be used as a city hall annex. But they have offered to cooperate with a newly elected city electrician provided "political pressure" can be eliminated.

Greenlee Benders Back Up Every Claim On the Job!

M.H.

Greenlee Tool Co
Rockford, Illinois

Gentlemen:

Last June you shipped us 1 No. 770 Conduit bender.

We asked for a 10 day trial. Ten minutes was enough.

We really should have another one.

Yours very truly,
m.H. Salmon
M. H. SALMON ELECTRIC CO. INC

S:HBF

Here is what one user said.

In just 27 words, Mr. M. H. Salmon, of Syracuse, N. Y., has adequately summed up the reactions of hundreds of users of the Greenlee Hydraulic Bender. Contractors, large and small, all agree that the Greenlee, with its powerful hydraulic unit, makes the job of bending conduit so simple and easy that enough money can be saved on labor costs and the elimination of costly manufactured bends on the first few jobs to more than pay for the bender. Write for Catalog 31E, a handy reference to the Greenlee line of Conduit Benders, Cable Pullers, Knockout Tools, Joist Borers, Electricians' Bits, Pipe Pushers, and Push Drills.

Shown above is the No. 770, with a maximum pressure of 25-tons, to bend conduit from 1¼ to 3-inch size. The No. 775 has a maximum pressure of 40-tons, for conduit from 3 to 4½-inch.

GREENLEE TOOL CO.
1706 COLUMBIA AVENUE
ROCKFORD, ILLINOIS

GREENLEE TOOL CO., 1706 Columbia Ave., Rockford, Ill.
☐ SEND ME A COPY OF GREENLEE CATALOG NO. 31E.
ALSO INFORMATION ON.....
Name.....
Address.....
City..... State.....
My Jobber Is.....E.C. 5-40

SHAWMUT IS THE WORD FOR FUSES

The **CHASE-SHAWMUT COMPANY**

NEWBURYPORT MASSACHUSETTS

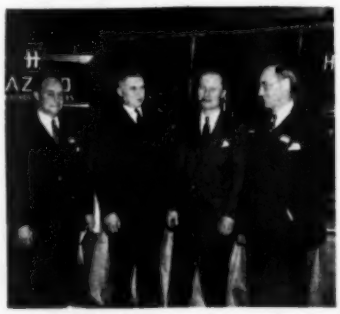
In the News

[FROM PAGE 93]

Hartford League Launches Spring Program

The Hartford Electric League with the cooperation of the Hartford Electric Light Company and the General Electric Company, set the stage for its spring buying campaign with the production of an electrical extravaganza called the "Cavalcade of Electricity," timed to commemorate the birth of Thomas A. Edison.

The League hopes this spring program will: (1) Stir the public's imagination and create a receptive frame of mind toward better living—electrically, (2) Afford an opportunity for large and small dealers to tie-in with individual activity and capitalize on the general publicity, (3) Unite the entire industry in a spring drive to stir up more business of all types.



ALL SET to answer thousands of inquiries at the Boston Trade Show were the following Okonite representatives: C. W. Lyons (left), district manager for New England; R. J. McGoldrick, New England agent; R. Soutter, sales engineer, Boston; and Carl P. Brodhun, sales manager of Wilkes-Barre, Pa.

"Where You Can't Go"

L. Bonnecaze, Jr., of the Best Electric Company, a New Orleans motor shop, calls himself an "Electrical Machinery Specialist." He sells his shop as a supporting service to the plant maintenance staff. He points out that—"We pick up ideas in other plants where you can't get in." And all this experience becomes available.

New Headquarters

The Electric Maintenance Company of Boston, formerly located at 297 Atlantic Avenue, is now occupying its new home at 79-81 India Street. The company, an established motor repair shop since 1898, now has four floors with 8000 sq.ft. of area in which to expand and continue its service.

These **SOLDERING LUGS**

Have Every Feature You've Wanted

- **POSITIVE CONTACT**
- **PURE COPPER**
- **GREAT STRENGTH**

Sherman Lugs are *quality* through and through. They're clean, smooth, accurately sized, with *flat* contact surfaces. And—they're made from purest copper. Full range of styles and sizes, completely interchangeable with cast lugs.

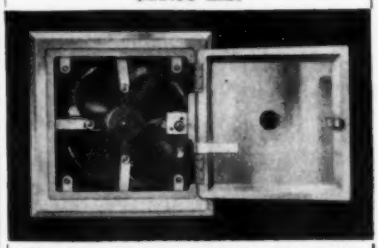
Samples gladly furnished on memo invoice

Heavy Duty Copper Tubing Lugs, in 2 and 4 hole styles.

Patented Sherman Seamless Round End Lugs, available in small sizes.

H. B. SHERMAN MFG. CO.
Battle Creek, Mich.

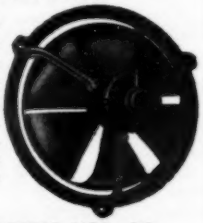
NEW LOW PRICE
$21.50 List



Signal announces a reduced price on the V-50 Wall Box Kitchen Vent Fan. A bigger value than ever. See your jobber today.

NOW BALL BEARINGS
At Same Price

Signal 12", 16" and 18" Bucket Blade Exhaust Fans now furnished with ball bearing motors. No price increase. Your jobber has them or will get them for you.



SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan
Offices in all principal cities

SIGNAL

Lighting For Farmers

When electric service comes to farmers, they are prone to install a few bare lamps and feel that they have sufficient light. This condition exists, according to Miss Myrtle Fashbender, Westinghouse home lighting specialist, because—

1. The farmer does not know what is the best lighting to install.
2. He cannot afford to pay for modern fixtures.
3. Lamps and fixtures of good design are not readily available.

But if a farmer starts with good lighting he will continue to have the best he can obtain. If he starts with poor lighting, after a few years he will have to be resold on good lighting.

FIXTURE DISPLAY—J. Grim of G & G Electric Co., Olympia, Wash., displays only modern, light-controlling types of domestic fixtures. A real believer in good lighting, he sells fluorescent jobs for high intensity and adequate wiring. In the store itself, he uses both the fluorescent and incandescent lamp fixtures as samples by which to sell his customers good lighting.

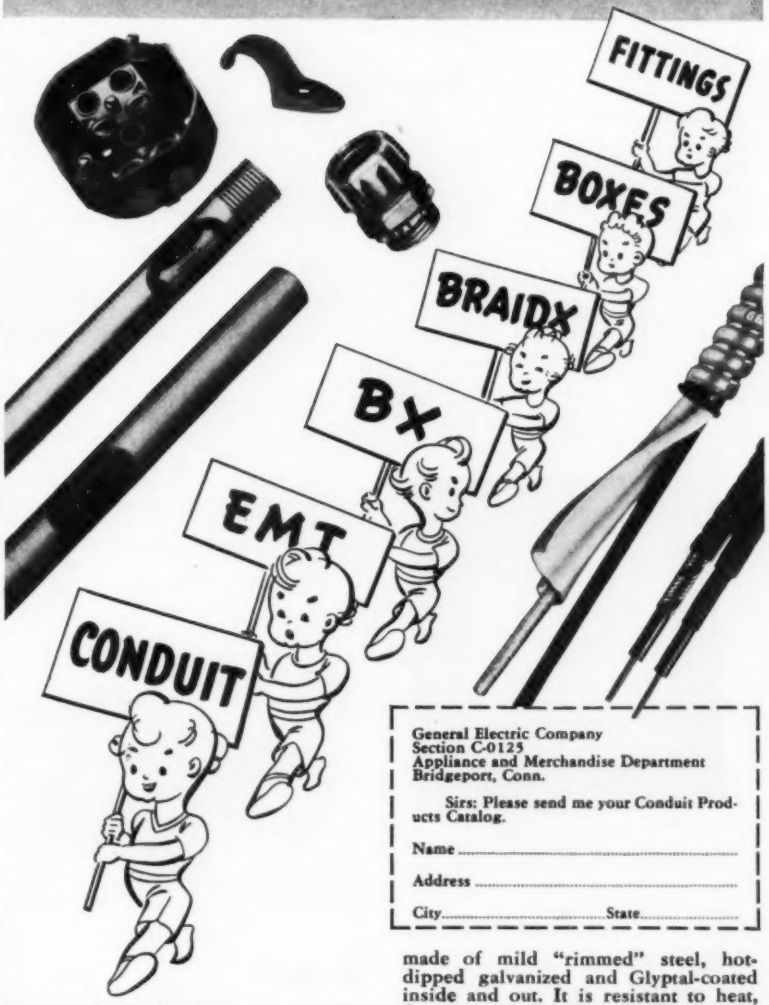
Langford Electric Moves

The Langford Electric Company, Minneapolis, formerly located at 511 South Third St., is now occupying its enlarged quarters on the seventh floor of the Metropolitan Life Building. The company's principal activities during the last two years have been in REA work covering Minnesota, Illinois, Michigan and Montana.

Be On Call

Kaiser and Kauppert of the General Electrical Specialties Co., a motor shop in Hollis, Long Island, have a good selling idea. They have a list of manufacturers of motorized equipment. They write these manufacturers occasionally, soliciting their service business in that area. They get themselves listed for a call when trouble comes. And it brings in a lot of business and many good contacts with local factories.

INVESTIGATE G-E QUALITY CONDUIT PRODUCTS BEFORE YOU BUY!



General Electric Company
Section C-0125
Appliance and Merchandise Department
Bridgeport, Conn.

Sirs: Please send me your Conduit Products Catalog.

Name .....

Address .....

City ..... State .....

For ease of installation, customer satisfaction, and freedom from service calls, due to breakdown of materials, select G-E Conduit Products—G-E White Rigid Conduit or G-E Electrical Metallic Tubing or G-E BX Armored Cable or G-E BraidX. All of these materials are made according to rigid specifications and are leaders in their class.

G-E White Rigid Conduit provides lasting protection for wiring systems. It is made of mild "rimmed" steel, hot-dipped galvanized and Glyptal-coated inside and out. It is resistant to heat, flame, gas, acids, alkalies and moisture.

All other G-E Conduit Products also give lasting service. Moreover, there is a complete line of G-E Boxes and Fittings. No makeshift installations are necessary when you use G-E Conduit Products.

For further information see the nearest G-E Merchandise Distributor or send the coupon above for a G-E Conduit Products Catalog.

GENERAL ELECTRIC

EQUIPMENT News

Duplex Recorder

A new duplex instrument for recording simultaneously kilowatts and rkva or kilowatts and frequency, or volts and amperes. Designed for cement mills to record kiln speed and temperature on single chart, it may be had with any two elements formerly available singly in Type CD instruments. Timed by a high-torque Telechron motor or an 8-day spring clock, chart carriage feeds paper at 1, 2 or 3 inches per hour. Two recording mechanisms are enclosed in case for semiflush switchboard mounting. Connections are made on back of case. General Electric Co., Schenectady, N. Y.

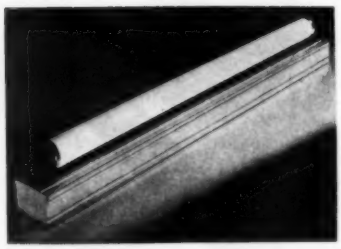
G-E DUPLEX RECORDER

■

Receptacle

A new bakelite duplex flush receptacle, with ratings of 15-amp., 125-volt and 10-amp., 250-volt. Some of the features are improved pressure contacts; wide ears measuring ⅝-in.; heavy gauge terminal screws with large heads; tapered ends to permit clearance of ABC clamps; shallow in construction. Eagle Electric Mfg. Co., Inc., 59 Hall Street, Brooklyn, N. Y.

EAGLE DUPLEX RECEPTACLE



SPLAYLITE FLUORESCENT UNIT

Fluorescent Unit

"Snapstrip" is a fluorescent product, supplied in units for single lamp or continuous lamps. Ends with double knockout clamp on to channel. Cover snaps on and ballasts are secured by set screw clips. Splaylite Division, National Store Fronts, Boston, Mass.

■

CLAROSTAT RESISTOR

Resistor

Series resistors for inclusion in power circuit of fluorescent lamps operated on d.c. are available as an accessory or built-in initial equipment. Series FT or accessory type plugs into circuit. Available for 15-watt and 20-watt fluorescent lamps. Built-in or initial equipment Series GT unit is oblong-shaped, flat and fits into any standard fluorescent fixture channel. Square perforated metal casing and base with mounting slots. Asbestos covered leads. Contains wire-wound cement-coated power resistor. Comes in five types to take care of 15- and 20-watt lamps on 120-volt, and 30- and 40-watt lamps on 240-volt. Clarostat Mfg. Co., Inc., 285 North Sixth St., Brooklyn, N. Y.

DICTOGRAPH TELEMATIC SYSTEM

Intercommunicating System

The Telematic is a 5-station interoffice communication system designed for use in small offices and business organizations. Master station has four line connections and release button which restores line buttons and controls buzzer circuit. Equipped with enclosed loudspeaker, transmitter and earpiece receiver on left for privacy. Intercom-Station has four line connections, ringing button and equipped with handset, mounted on side, which releases all buttons when returned to cradle. Dictograph Sales Corp., 580 Fifth Avenue, New York.

■

WESTINGHOUSE IMMERSION HEATER

Immersion Heater

A new flange head oil immersion heater for use in high pressure systems. Heater tubes are of steel, silver soldered into cast iron head and units are made for circulating and non-circulating systems. Non-circulating heaters have rating of from 1 to 3 kw. for 115- or 230-volts with two heater tubes ranging in length from 14½- to 37½-inches. Circulating heaters have either 2 or 4 heater tubes from 33½- to 37½-inches long with rating of from 5 to 8 kw. for 230 volts. Westinghouse Electric & Manufacturing Co., Mansfield, Ohio.

■

Concrete Boxes

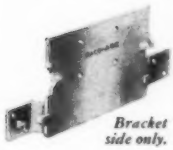
These boxes are designed to assure no cracks for concrete to seep in, and ample clearance for locknuts. Boxes are welded at seams with knockouts. Cover ears are welded and drilled after assembly, to insure correct center to center distance. Ears drilled after assembly to assure full threads with no distortion of tapped holes. Nailing lugs not integral with one set ear lugs. Walker Electrical Company, Atlanta, Ga.

UMI

YOU'LL WANT THESE

"RACO" ALL-STEEL SIDE MOUNTS

NEW DETACHABLE MOUNTING BRACKET ON SWITCH BOXES FOR WALLBOARD, SHEETROCK AND SIMILAR INSTALLATIONS



Bracket side only.

Why put up with unsightly bulges, in an otherwise smooth wallboard installation, caused by the usual types of bracket boxes,—or

Why incur the additional expense of channeling to recess the usual type of bracket box in order to prevent these bulges?

Here's the way RACO•ALL-STEEL has eliminated another headache for the contractor.

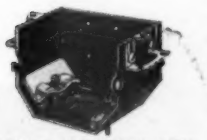
RACO•ALL-STEEL Side Mounts are mounted on the side instead of the face of the 2 x 4. The Side Mount Box may be spaced accurately for the thickness of the kind of board being used. It may be anchored temporarily, for checking, by means of the pointed projection provided. And then, in perfect alignment, fastened securely in its permanent position.

Where this type of installation is the exception, wholesalers may stock the bracket only. Assembly on RACO• ALL-STEEL rectangular boxes is quick and easy.

Experienced engineering keeps RACO•ALL-STEEL PRODUCTS in step with the wiring trends in every section of the country. They provide many advantages for rural and urban modernization work, as well as on new jobs. Write for your copy of the RACO•ALL-STEEL PRODUCTS catalog—there is no obligation.

Distributed nationally by:

ALL-STEEL-EQUIP COMPANY
INCORPORATED
605 Griffith Avenue, Aurora, Illinois
Factories: **South Bend, Ind.; Aurora, Ill.**



RACO • ALL-STEEL BEVELED CORNER SWITCH BOX for all types of non-metallic cables.

RACO • ALL-STEEL METALLIC CABLE BOX —3½" or 4" octagon with non-protruding clamp screws. Box may be installed on flat surface.

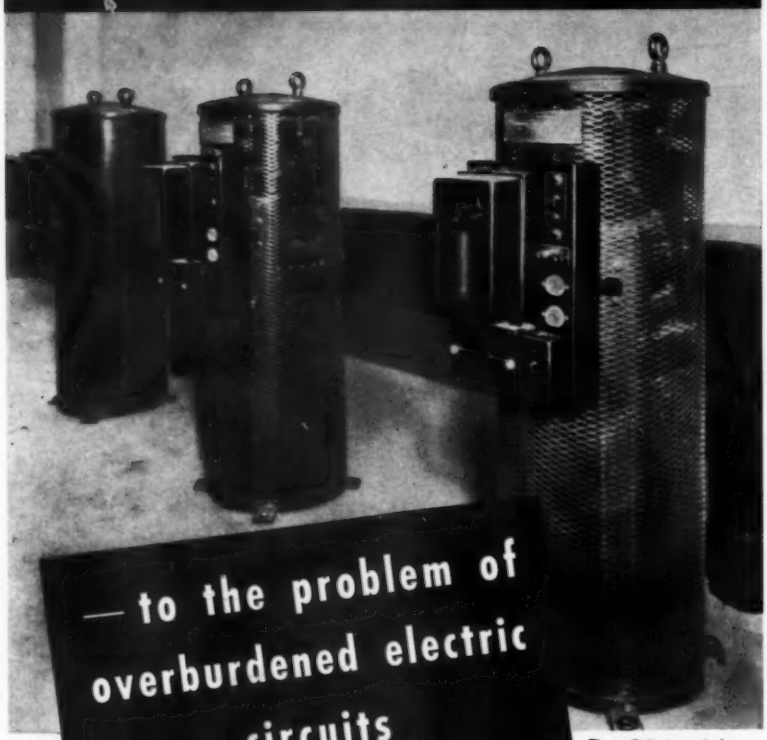
RACO • ALL-STEEL BOX for sidewall bracket—2" vertical adjustment. Bridge is threaded for ½" nipple and equipped with set screw.

RACO • ALL-STEEL 4" SQUARE BOX with mounting bracket. Simplifies the installation of switches and receptacles.

RACO•ALL-STEEL CABLE BOX—3½" or 4" octagon. Permits side or back entrance of all sizes of non-metallic cables.

RACO • ALL-STEEL • PRODUCTS
Switch Boxes • Outlet Boxes • Cutout Boxes • Cabinets • Conduit Fittings
Distributors in All Important Centers

Here's the ECONOMICAL ANSWER



— to the problem of overburdened electric circuits

These G-E air-cooled regulators assure proper voltage on a lighting circuit in mill of Hanes Hosiery Mills Company, Winston-Salem, N. C.

IF YOUR motors are sluggish—if your lights don't seem to have the brilliance they should, then the chances are your power-distribution system has a bad case of undervoltage. And it's ten to one that the most economical, effective remedy is to install one of our new industrial-type voltage regulators.

These regulators—Type AIRS—automatically maintain the proper voltage, thus keeping lamps and motors operating at peak efficiency and contributing to increased production.

Type AIRS regulators are easy to install—they're air-cooled and require no fireproof enclosing vault. You can put them anywhere, even on overhead platforms if floor space is at a premium. They're available for circuits from 120 to 600 volts, in ratings from 1.2 to 12 kva.

Ask your G-E representative for complete information or write today for Bulletin GEA-3057. Address General Electric, Schenectady, N. Y.

A Few of the Industries Already Using These Profit-building Regulators

Oil refineries	Testing laboratories
Chemical plants	Construction contractors
Foundries	Glass manufacturers
Oil pipe lines	Radio manufacturers
Radio stations	Refrigerator manufacturers
Lamp manufacturers	Valve manufacturers

Special AIRS regulators can be used to control current, temperature, or any other variable which can be made to depend upon voltage.

GENERAL ELECTRIC

In the News

[FROM PAGE 96]

Instrument

The Fluortest instrument is for demonstrating and testing separately or in combination, fluorescent lamps, starting switches and all control apparatus for commercial use, known as auxiliaries, ballasts, choke coils, compensators, reactors. Also for checking completed installations and fixture assemblies in wired circuits; detecting and analyzing causes of trouble. Operates on 110-120-volt a.c. and 220-240-volt a.c. or d.c. Zephyr-Lite Manufacturing Co., 169 North Racine Ave., Chicago, Ill.

ZEPHYR-LITE INSTRUMENT

■

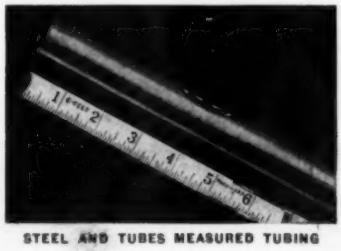
Electrode

"Stainweld D" electrode is for arc welding stainless steel of 25 per cent chromium, 20 per cent nickel type. Also for welding various stainless steels to mild steel and for welding of steels which are air hardening and cannot be heat treated after welding. For vertical and overhead use $\frac{5}{32}$-in. electrode. Sizes are $\frac{5}{32}$-, $\frac{1}{4}$-, $\frac{5}{32}$-, $\frac{3}{16}$- and $\frac{1}{4}$-inch. Lincoln Electric Co., Cleveland, Ohio.

■

Measured Metallic Tubing

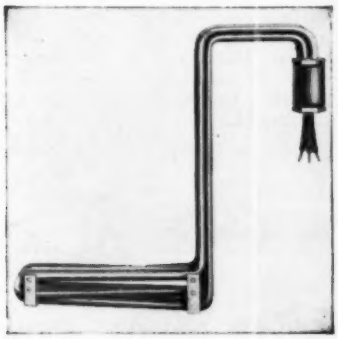
Electrunite Steel tubes is now available with inch-marks on every length, which has a foot-rule clearly printed in blue ink right on the tube. Eliminates necessity of holding a ruler against the tube to measure required distance. Helps to make more accurate bends, and reduces error. Steel and Tubes Division, Republic Steel Corp., Cleveland, Ohio.



STEEL AND TUBES MEASURED TUBING

Immersion Heaters

A new Corox immersion heater for oil tempering baths has been developed. Heaters have low watt density of approximately 11 watts per square inch of active tube surface. Available with heating depth of either 5 or 10 inches. The 5-inch units have rating of 2000 watts at 115-or 230-volts, and 10-inch a rating of 4000 watts at 115- or 230-volts. May also be connected in series on 440 volts. Westinghouse Electric & Manufacturing Co., Mansfield, Ohio.



WESTINGHOUSE IMMERSION HEATER

■

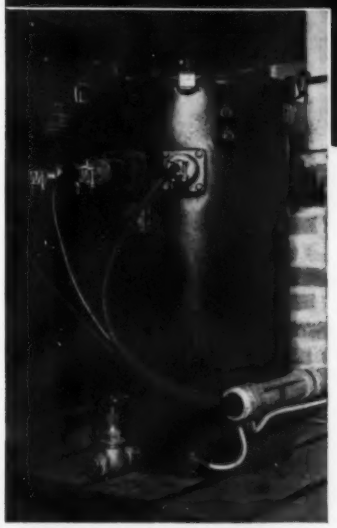
Starter and Switch

A combination across-the-line starter and motor disconnect switch, Bulletin 9589, for use with squirrel cage and single phase motors. Front operated, contactor type disconnect switch incorporates vertical contacts which are interchangeable with the across-the-line starter contacts. Overload protection is provided by eutectic alloy thermal overload relay. Available with either three or four poles, in five sizes, horsepower ratings from 6½ to 200 hp. Cutler-Hammer, Inc., 315 N. 12th Street, Milwaukee, Wis.

CUTLER-HAMMER COMBINATION STARTER

YOU GET *Triple* SAVINGS

WITH G-E PYRANOL TRANSFORMERS INSTALLED INDOORS *at Load Centers*



Profitable investment for Cranberry Canners, Inc., of South Hampton, Mass.—a 25-kva Pyranol transformer installed indoors *near the load center without a vault*

1. You cut installation costs

Pyranol transformers can be installed anywhere in the plant *without a vault* because Pyranol, the cooling and insulating liquid with which they are filled, is noninflammable.

2. You reduce power-distribution losses

By installing Pyranol transformers right at load centers—even on overhead platforms if floor space is at a premium—you eliminate the need of long, expensive secondary feeders and cut copper losses to the minimum.

3. You save on maintenance

Because Pyranol is nonsludging and because Pyranol transformers are built with pressure-tight tanks to prevent evaporation and contamination, maintenance is much less than on oil-filled transformers.

It will pay you to investigate the possibilities of economical load-center distribution with Pyranol transformers. Ask your G-E representative for complete information, or write for Bulletin GEA-2637. General Electric Company, Schenectady, N. Y.

These 200-kva Pyranol transformers are installed in the motor room of the new cold-mill addition to the McLouth Steel Corporation plant, Detroit, Mich. They meant savings in installation costs, feeder costs, and copper losses, because *primary power was brought right to the load*

GENERAL ELECTRIC

402-6

SELL *Better* LIGHTING MAKE *More* PROFIT

5518 5-Light

"Good Lighting From Any Angle"

An attractive unit that has a wide range of applications from 8-eighteen watt to 7-forty watt Fluorescent bulbs, in 18, 24, 36 and 48 inch lengths.

EFCOLITE offers a finer type of Fluorescent lighting fixture that will give lasting customer satisfaction and insure greater profits for you.

The Efcolite line features a wide selection of attractive modern designs, scientifically engineered to give maximum lighting efficiency for every type of installation.

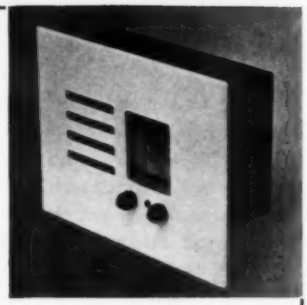
EFCOLITE *Fluorescent* CATALOG "H-50" WILL GIVE YOU MANY SALES IDEAS

EFCOLITE CORPORATION TRENTON, N. J.

Revolutionary! New!

FLUSH WALL RADIO

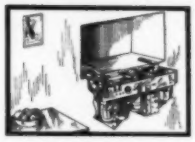
Retails at $29.95



for kitchen, playroom, bedroom, bathroom

New Profits for Contractors

Standard 5-tube Philco Radio (or equivalent) completely concealed by standard panel of white baked-on synthetic resin finish Masonite. (Available unfinished, or in practically any desired color at slight additional cost.) Size overall: 8⅝" x 11¼" x 3⅞". Approved by Underwriters Laboratories.



Installation

Simply install steel box as furnished, same as any panel box, connecting armoured cable or other wiring to knockout in box. Antenna (furnished) is concealed in walls, except in concrete and steel buildings. When wall is plastered, etc., radio is attached by patented slotted hinges, connections made and adjusted flush with wall plate attached by screws (furnished).

EASY TO INSTALL
EASY TO SERVICE

Once the steel outlet box is installed, the radio unit can be put in place at any time after wall is plastered and painted. To service, just remove wall plate and swing set out on its hinges.

FREE! Carrying case for use in demonstrating with initial prepaid order.

Tear Out . . . Mail this Coupon Today!

Flush Wall Radio Company, 57 State St., Newark, N. J.

1—Please send me — Model 5P Flush Wall Radio with hinges, complete with steel box, antenna and white panel (at $19.95 Dealer's Net Price Each f.o.b. Factory).....By prepaying this order, I understand I am entitled to one carrying case FREE.

2—Please mail full details. ☐
Check here if to be billed through jobber ☐
(Attach Name and Address of Jobber)

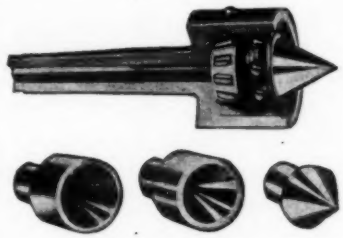
Name .....
Address .....
City & State .....

EQUIPMENT *News*

[FROM PAGE 99]

Live Center

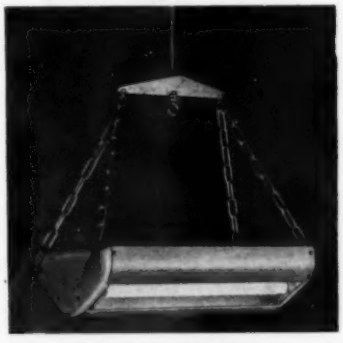
A new live center with interchangeable inserts or center pieces for holding centered and uncentered work. Three inserts are available—male insert for work already centered; plain female insert for uncentered work; female insert with three raised lands for uncentered work having flat or burred keyway. Inserts removed by knockout screw. Cuttings, oil, dirt and chips are kept out by sealed ball bearings. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Ill.



IDEAL CENTER

Lighting Fixture

A ceiling type fluorescent lighting fixture designed for use in offices, industries and homes. It has five 18-in., T-8 tubes and is for direct and indirect lighting. Shell of light is interchangeable so that three tubes may be used for indirect and two for direct, or vice versa. Tubes and Alzak aluminum reflectors are enclosed under three diffusing glass covers. Overall dimension of light face is 14- by 19-inches, distance from top of ceiling canopy to bottom is 32 inches. Available for operation on 50 cycles, 110-125-volts a.c.; 60 cycles, 110-125-volts a.c. and 110-120-volts d.c. Ritter Dental Manufacturing Co., Inc., Rochester, N. Y.



RITTER FLUORESCENT LIGHT

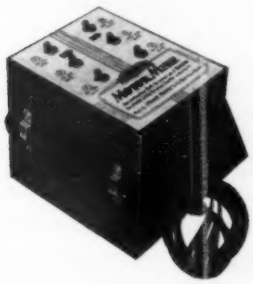
Reflector

The separable reflector is now furnished with new steel hood. Thinner wall provides additional wiring space. A quarter turn releases or attaches reflector. No screws to loosen or corrode. It is fitted with resilient socket, which is removable. Socket is spring mounted to absorb vibration. To install, it is necessary only to attach hood and wire socket. Reflector can be snapped in place later. Goodrich Electric Co., 2900 N. Oakley Ave., Chicago, Ill.

GOODRICH REFLECTOR

Indicator

The motor starting capacitor indicator, Motormike, serves as an emergency condenser for 110-volt 60 cycle motors where capacities from 54 mfd. to 180 mfd. are required. It contains heavy-duty sections, which will take plenty of overload and can be used for continuous motor starting service if desired. Fustats give double protection. Sprague Products Company, North Adams, Mass.



SPRAGUE INSTRUMENT

Starting Switch

A replaceable thermal-type starting switch for fluorescent lamps. Switch and condenser are both assembled into metal container fitted with a 4-pin octal base. Fits any standard radio-type octal socket. Socket may be installed at any desired location on fixture. Available for 15-, 20-, 30- and 40-watt lamps. Carlton Lamp Corporation, 811 - 30th Street, Union City, New Jersey.

RITTENHOUSE

The Quality Chime Line!

BUILT UP TO A STANDARD
NOT DOWN TO A PRICE!

PRESIDENT MODEL $6.95 TO $11.50

SELL RITTENHOUSE CHIMES
FOR CUSTOMERS' SATISFACTION
...and here's why!

1 *Better* TONE QUALITY—The use of special chime alloys, plus correct acoustical design and superb craftsmanship result in the matchless tone quality of Rittenhouse Chimes. We invite you to compare it with others.

2 *Better* STYLING—A variety of graceful, chaste designs to harmonize with any home decorative theme. Many nationally famous interior decorators are using Rittenhouse Chimes—proof of their style acceptance.

3 *Better* CONSTRUCTION—Improved, simple, "fool-proof" mechanisms developed by Rittenhouse engineers. Strong, rugged construction. Every chime is carefully tested before leaving factory and fully guaranteed against any defect in material or workmanship.

4 *Better* VALUE—Whatever Rittenhouse product you may buy you are assured of full value for the price. For only a few cents more than the lowest, you can buy Rittenhouse quality and prestige that can't be obtained elsewhere at any price.

THE A. E. RITTENHOUSE CO., INC. Dept. 615—Homoyo Falls, N. Y.

NATIONAL ADVERTISING BUILDS PUBLIC ACCEPTANCE

Rittenhouse is the chime line the public knows best because of consistent advertising over a period of years. For customer-satisfaction sell Rittenhouse Chimes.

DEALER HELPS

Rittenhouse backs up dealers with a complete merchandising service consisting of demonstration boards, displays, posters, folders, newspaper mats, catalog cuts, etc. Rittenhouse's strict sales policy protects your interests.

RITTENHOUSE
DOOR CHIMES

easily—

swiftly—

"for KEEPS"!

That's the way you can make *all* your electrical connections . . . with

ILSCO

SOLDERLESS LUGS

Look for the V-Bottom wire opening — a "first" for ILSCO — the source of "for keeps" grip.

- ***Look to your Electrical Wholesaler for your electrical needs.***

DEPT. 5 EC

Ilsco Copper Tube & Products, Inc.

5629 Madison Road, Cincinnati, Ohio

Your first trial with CLIPPER supports will convince you that it is the best, easiest and quickest way to obtain the desired results.

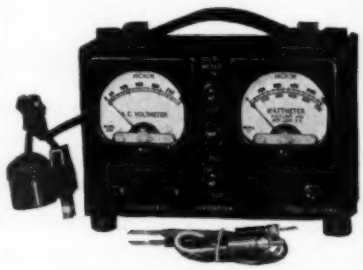
CLIPPER MANUFACTURING CO.
42 E. Strand, Kingston, N. Y.
Please send information on the Electrician's Guide and CLIPPER outlet box supports.
Name.....
Address.....
City.....
State.....
My jobber is.....

EQUIPMENT NEWS

[FROM PAGE 101]

Instrument

This meter instrument checks line voltage while measuring consumption in watts in appliances. Voltage drop through house wires checked by noting drop in voltmeter reading when appliance is plugged in. It checks starting coils in fractional hp. single phase motors. Watts are on two ranges—0-750 and 0-1500. Wattmeter has electrodynamometer movement and a uniform scale. Voltmeter has range 0-300 with red line at 110 and 211-volts. Two sets of leads are supplied. Fuse protects all volt circuits. Meters may be connected to circuit under test. For a.c. or d.c. Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio.

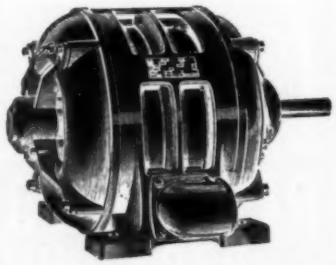


HICKOK VOLT-WATTMETER

■

Motor

A new "Lo-Amp" electric motor designed for use on refrigerating and air-conditioning installations. It has low locked rotor current and can be supplied with either high starting torque or normal starting torque. It does not have any centrifugal switches, relays, brushes or slip rings. The Louis Allis Co., Milwaukee, Wis.



LOUIS ALLIS MOTOR

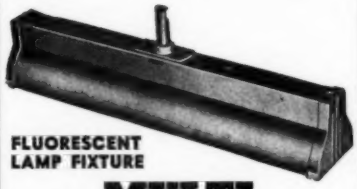
TWO-PIECE GLASSTEEL DIFFUSER

MULTI

Reflectors

STEP UP YOUR SALES . . .

The line of reflectors manufactured by Multi is so complete it gives you a great many opportunities for good business. Contractors like them because they are simple to install and give no trouble—users like them because they are economical and high in lighting efficiency. Step up your sales now — send for catalog today!



FLUORESCENT LAMP FIXTURE

MULTI

ELECTRICAL MANUFACTURING CO.

1840 W. 14th ST. CHICAGO, ILL

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

Cadmium and Everdur
MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

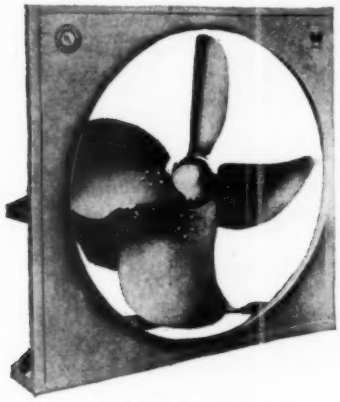
New York City Office
Theodore B. Dally
50 Church Street

MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

UMI

Attic Fan

This attic fan, known as Type E, is equipped with a one-piece venturi orifice, increasing cubic air displacement of any given size. Propeller is redesigned to operate at a lower speed. Motor is of ball bearing type, and equipped with rubber mounted belt tension device. Available in seven sizes ranging in air delivery from 5,000 to 25,000 CFM. Chelsea Fan & Blower Co., Inc., 370 West 15th Street, New York, N. Y.

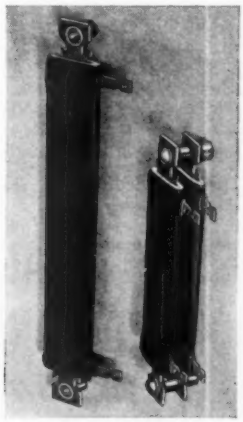


CHELSEA ATTIC FAN

■

Resistors

Resistance wire of this resistor is space wound upon a Steatite core of eliptical cross section, having maximum thickness of ¼-in. at its minor axis. Ends of winding are brazed to terminals, and entire element embedded in fused vitreous enamel. Available with intermediate taps, adjustable contact bands, non-inductive winding, non-standard lengths and ratings. Can be mounted either singly or stacked. Hardwick, Hindle, Inc., Newark, N. J.



HARDWICK, HINDLE RESISTORS

Bend up to 4 inch pipe
RIGHT AT THE JOB
with Porto-Power!

NEW—Blackhawk Porto-Power Benders really make perfect bending practical and profitable... here's why:

- ✓ *NO JACKNIFING*—No loose extension bars, tension arms and ram collars—bending frame is ONE sturdy unit.
- ✓ *PORTABLE*—Light weight, rolls to job.
- ✓ *SPEEDY SET-UP*—Lock-On "Pull Pin" quickly fastens 4-sided Pivot Shoe in any one of 6 positions. No bolts, no nuts, no wrenches. One man can easily position and operate bender.
- ✓ *DEPENDABLE HYDRAULIC UNIT*—20-ton hydraulic ram and remote control pump — smooth, giant power for ACCURATE bending. Finger turn of pump release valve retracts ram automatically to proper distance for re-positioning after each bend.
- ✓ *EXTRA UTILITY*—Hydraulic ram with special attachments also handles big range of press, bend, push and lift jobs.
- ✓ *LOW COST*—Porto-Power is standard equipment in many fields —permitting low-cost production of this famous remotely controlled hydraulic unit.

ORDER FROM YOUR INDUSTRIAL SUPPLY HOUSE TODAY — or send coupon to Blackhawk for catalog and prices. Pay for Porto-Power on the next job through big savings in time and materials.

A Product of BLACKHAWK MFG. CO.
Dept. P2050, Milwaukee, Wis.

S-30A
Handles popular 1 in. to 2 in. sizes $97.25*
*Slightly higher in West and Canada.

MAIL COUPON NOW
BLACKHAWK MFG. COMPANY
Dept. P2050, Milwaukee, Wis.
Send full information on your Pipe Benders.
Name .....
Company .....
Address .....

BLACKHAWK
WORLD'S LARGEST MANUFACTURER OF HYDRAULIC JACKS

The Little Man Who's Always There
— in Quality,
— in Performance,
— in Value!

THE TRADE RATTAN MARK MAN

THE MARR CONNECTOR

Take a screw driver — twist — nothing else required to make a perfect joint with the MARR CONNECTOR. We'll be glad to send you a SAMPLE — FREE!

Approved by Underwriters

THE RATTAN MANUFACTURING COMPANY
522 STATE STREET
NEW HAVEN, CONN., U. S. A.
GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET, NEW YORK, N. Y., U. S. A.

WOLVERINE SOLDERING LUGS

- *High-Conductivity*
- *Square-End*
- *Uniform Dimensions*

BUY FROM YOUR JOBBER

WOLVERINE TUBE CO.
DETROIT, MICHIGAN

EQUIPMENT NEWS

[FROM PAGE 103]

Solderer

A new electric solderer, called "Instant Heat", is recommended for all kinds of light soldering. Heats instantly upon touching wire or terminal to be soldered. Heating stops upon taking carbons away from wire or terminal. Line current is reduced by transformer to a low voltage. When soldering, heat is concentrated on part being soldered, eliminating danger of damaging adjacent parts. Current is used only when in actual contact with work. Complete unit includes transformer and soldering tool. Size of tool is 6½ by ½ in. in diameter. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Illinois.

IDEAL COMMUTATOR SOLDERER

■

Motor Switch

Plugging switch for controlling motor stopping has Alnico magnet as its fundamental part, eliminating frictional parts or clutches. Features are compact design, low operating torque and immunity to heat. A driven rotor produces a rotating magnetic field which induces eddy currents in walls of aluminum cup. Magnetic reaction turns cup through limited rotation, and contacts are operated by Textolite rod. Centering springs keep contacts in normal position. Changing spring tension adjusts tripping speed over a definite range. General Electric Co., Schenectady, N. Y.

G-E PLUGGING SWITCH

ATTENTION

MOTOR MFRS.

Electrical Contracting has just completed a survey of motor buying based on reports from 600 motor buyers.

This 36 page report is available to motor manufacturers without charge, on request.

WRITE

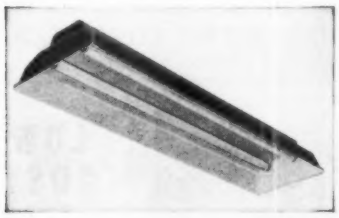
MARKET RESEARCH DEPT.

ELECTRICAL CONTRACTING

330 W. 42nd St., New York

Luminaire

A new 48-in., 2-lamp, 40-watt fluorescent luminaire with spread distribution designed for general or supplementary lighting in low bay industrial areas. Units are furnished wired complete with hood, reflector, lamp holder, lamp starter and ballast equipment for 110-125, 199-216 or 220-250-volt circuits. Knockouts at each end for end-to-end mounting and straight-through wiring. Units arranged for rigid conduit, flexible conduit or chain suspension mounting. Westinghouse Electric and Manufacturing Co., Cleveland, Ohio.



WESTINGHOUSE LUMINAIRE

■

Socket Extension

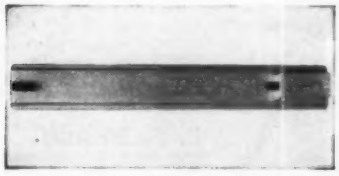
Bakelite socket extension with a rating of 660-watt, 250-volt. Some of the features are 1¼-in. O.D. flange on husk for fastening clamp holders of the B. S. socket type and adaptable to W. P. type; one piece shell combining both male and female threads; shell locked by means of an undercut in bakelite husk; extends socket 1⅜-in., overall length 2 7/16-in. Eagle Electric Mfg. Co., Inc., 59 Hall Street, Brooklyn, N. Y.

EAGLE SOCKET EXTENSION

■

Fixture

A new Sterilamp fixture designed for use in walk-in refrigerators, bakeries and other places where wide-spread, bacteria-killing ultraviolet radiation is required. Operates on 110-120-volt, 60-cycle a.c. At one end of fixture is a transformer in box 7 by 3⅜ by 3 in. Socket must be placed in its forward or operating position to establish contact with lamp before cover can be replaced on transformer box. Switch is included in box with contact piece attached to cover. Westinghouse Lamp Division, Bloomfield, N. J.



WESTINGHOUSE STERILAMP FIXTURE

QUICKER *and* EASIER

to install KWIKON

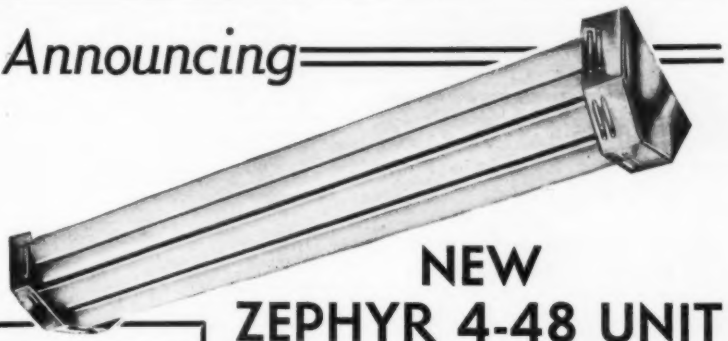
Set Screw "E.M.T." Fittings

Just a few simple turns with a screwdriver and they're on securely. They're easier to reach in "hard-to-get-at" places, too. Ask your jobber, or write us, about the new, low prices.

Approved by Underwriters' Laboratories, Inc.

KWIKON CO. 626 W. JACKSON CHICAGO, ILLINOIS

Announcing



NEW ZEPHYR 4-48 UNIT

ZEPHYR 4-48

Sold with lamp holders, starter sockets, lead wire and plug. Ends are removable. Aluminum finish. 48" overall. Full specifications and prices on request.

Here is an all-purpose, all-direction fluorescent unit, designed to take care of high level lighting requirements. With the Zephyr Unit it is possible to light the ceiling—and at the same time spread light to the sides and directly down. The Zephyr unit uses four 40 Watt Lamps with two Tulamp ballasts. You can sell and install this unit in offices, stores, hotels, restaurants, schools, theaters, etc.—it has a wide variety of applications. Write for literature and price list.

Approved by Underwriters

REFLECTORS INC.

3225 FRANKFORD AVE. PHILADELPHIA, PA.

K&H Solderless Terminal LUGS

A SIZE and TYPE for every need!

To connect two wires varying either greatly in size, or slightly in size or two of the same size. Tightening bolts exert an even pressure on both wires. Clamping surface covers a large contact area and bolts permit high wrench torque, resulting in great pressure on conductors. Locking feature insures permanent connection.

UNIVERSAL PARALLEL TAP CONNECTOR

A request on your letterhead will bring your catalog.

KRUEGER and HUDEPOHL
232-8 Vine St.
CINCINNATI, OHIO

K&H Solderless CONNECTORS

Know Electricity as Experts Know It!

and Get an Expert's Pay!

What about your future? Who is safe today? Surely not the man who is contented to stand still! Know your job thoroughly—prepare yourself for jobs ahead. To do just this thousands of men have used

The Croft Library of Practical Electricity

6 volumes, 2155 pages—only $16.50

The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 59,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of six volumes for ten days' Examination. We take all the risk—you assume no obligation. If you decide to keep the books, send $1.50 in ten days and the balance at the rate of $3.00 a month. Send the coupon NOW and see the books for yourself.

Examination Coupon

McGRAW-HILL BOOK CO.
330 W. 42nd St., New York

You may send me the six volumes of the Croft Library of Practical Electricity for 10 days' examination. I agree to return the books, postpaid, in ten days or remit $1.50 then and $3.00 a month until the special price of $16.50 has been paid.
(To insure prompt shipment, write plainly and fill in all lines.)

Name .....
Home Address .....
City and State .....
Position .....
Name of Company ..... E.C. 5-40

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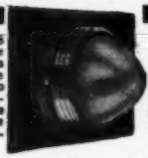
* See 1939-1940 Buyers' Reference number of Electrical Contracting for additional information on these companies and their products.

PILOT LIGHTS NEON EXIT LIGHTS

WRITE FOR CATALOG ON KIRKLAND BULLS-I-UNITS



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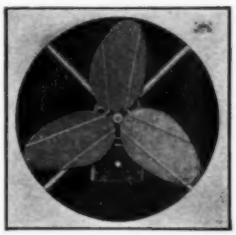

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Above—The Edgewood Hills and Edge Moor Terrace Developments, Wilmington, Delaware, have two hundred residences, ranging in price from $5990 to $25,000. All of the homes were sold *before completion* and 156 additional ones in the $5990 class are being built immediately. The Wilmington Construction Company is the builder and owner.

At left—Mr. Frank Briggs, (center), the electrical contractor and his assistants.

Contractor Briggs got this Job with

SQUARE D MULTI-BREAKERs

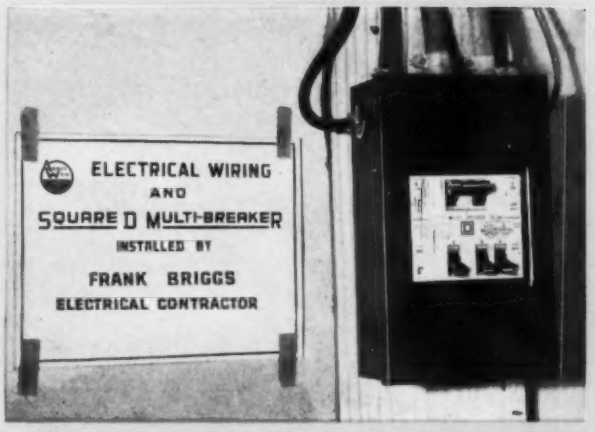
Here is a job any electrical contractor can be proud to claim—200 homes and 156 more to come! And Mr. Briggs goes on record to the effect that "the recommendation of using Square D Multi-breakeRs had a lot to do with my landing the job."

Every home in this development will enjoy Multi-breakeR convenience and protection. The smaller ones are wired with 3 and 4 circuit Multi-breakeRs, with the exception of some, where a range circuit has been provided. The larger homes have 6, 8 and 10 circuit load centers.

Mr. Briggs knew, from experience, that the builder would profit by Multi-breakeR installations. And the Wilmington Construction Company, having seen the Multi-breakeR play a real part in the immediate sale of these homes, heartily agrees with him.

Multi-breakeRs will help *you* get more and better wiring jobs. See your Square D distributor or write for Bulletin CA-543.

CALL IN A SQUARE D MAN



A typical Multi-breakeR installation in one of the smaller unfinished homes in the Edge Moor Terrace Development. Multi-breakeRs seldom add to the total wiring cost—in many cases actually cost less than the switch and fuse equipment they replace.

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DETROIT - MILWAUKEE - LOS ANGELES

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A corner in Wyvernwood

Wiring at Wyvernwood

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